ISO 9001-14001
18001 Certified

OFFICE OF THE SR. GENERAL MANAGER (ELECTRICAL)
UPPER INDRAVATI HYDRO ELECTRIC PROJECT, MUKHIGUDA,
DIST: KALAHANDI-766026, ODISHA, E-mail: sgmel_uihep@ohpcltd.com

ODISHA HYDRO POWER CORPORATION LTD. (A GOVERNMENT OF ODISHA UNDERTAKING)
Regd. Office OSPH & W.C Building, Vanivihar Chhak, Janpath, Bhoinagar, Bhubaneswar-751022,
Tel: 91-0674-2542983, 2542802, 2545526, 2542826, Fax:2542102, E-Mail: ohpc.co@gmail.com **/** md@ohpcltd.com
WEB: www.ohpcltd.com**, CIN: U40101OR1995SGC003963**

TENDER SPECIFICATION No. UIHEP-07/ 2025-26 Dated 05.05.2025
TENDER PAPER FOR DESIGN, MANUFACTURING, SUPPLY, ERECTION (INCLUDING UNLOADING & DRAGGING), TESTING & COMMISSIONING OF 01 NO. OF NEW 20 MVA, 220/33 KV POWER TRANSFORMER FOR UIHEP, MUKHIGUDA.

Name of the **Manufacturer / Manufacturer's channel partner**: -

……

……

Corresponding Address with Contact No. for correspondence

……

……

……

Cost of the Tender Paper: Rs. 10,000 + GST 18%
= Rs. 11,800/-

C O N T E N T S

(TECHNO – COMMERCIAL BID)

"DESIGN, MANUFACTURING, SUPPLY, ERECTION (INCLUDING UNLOADING & DRAGGING), TESTING & COMMISSIONING OF 01 NO. OF NEW 20 MVA, 220/33 KV POWER TRANSFORMER FOR UIHEP, MUKHIGUDA"

TENDER CALL NOTICE NO: UIHEP-07/ 2025-26 Dated 05.05.2025

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OFFICE OF THE SR. GENERAL MANAGER (ELECTRICAL)
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WEB: www.ohpcltd.com, **CIN: U40101OR1995SGC003963**

NOTICE INVITING TENDER No. UIHEP-07/ 2025-26 Dated 05.05.2025

Sealed Tenders are invited in two parts i.e. (i) Techno Commercial bid & (ii) Price bid in separate sealed envelopes from the **Registered Manufacturers/ Manufacturer's Channel Partner** having valid GST Registration Certificate & IT PAN for the following works as mentioned below.

Description of work	Cost of tender paper (Non-refundable) in Rs.	EMD in shape of DD/BC/BG (Refundable) in Rs.	Period of sale / download of tender document	Last date & time of receipt of tender	Date & time of opening of Techno commercial Bid
DESIGN, MANUFACTURING, SUPPLY, ERECTION (INCLUDING UNLOADING & DRAGGING), TESTING & COMMISSIONING OF 01 NO. OF NEW 20 MVA, 220/33 KV POWER TRANSFORMER FOR UIHEP, MUKHIGUDA	**11,800/-** (inclusive of GST)	**4,99,100/-**	From 12.05.2025 to 09.06.2025 up to 10.00 Hrs	09.06.2025 (up to 11:00 Hrs)	09.06.2025 at 12:00 Hrs

For details of the tender documents, terms and conditions please visit our website **www.ohpcltd.com**

-Sd-
Unit Head
UIHEP, Mukhiguda

SECTION – I

INSTUCTION TO TENDERER

1.1 SCOPE OF WORK & TECHNICAL SPECIFICATION:

The scope of work & technical specification are as per Section IV of this Tender Specification.

1.2 CORRESPONDENCE:

All correspondences shall be made in English only to "**The Unit Head, Upper Indravati Hydro Electric Project, At/Po – Mukhiguda, Dist – Kalahandi, Pin – 766026, Odisha**".

1.3 SCHEDULE OF DATES:

The various crucial dates relating to "**DESIGN, MANUFACTURING, SUPPLY, ERECTION (INCLUDING UNLOADING & DRAGGING), TESTING & COMMISSIONING OF 01 NO. OF NEW 20 MVA, 220/33 KV POWER TRANSFORMER FOR UIHEP, MUKHIGUDA**" are as notified in the tender notice.

1.4 COST OF TENDER PAPER:

The tender specification should be accompanied with the cost of tender paper as notified in the tender notice in shape of Bank draft / Bankers Cheque from any Nationalized Bank/ Scheduled Bank drawn in favour of "Odisha Hydro Power Corporation Ltd., UIHEP, MUKHIGUDA" payable at IOB, Mukhiguda / SBI, ADB, Jaipatna along with the tender documents for the tenderers those who download the tender specification from OHPC website or original money receipt of OHPC for the tenderers those who purchase the tender specification from office of the Sr. General Manager (El.), UIHEP, Mukhiguda, failing which the tender shall be out rightly rejected.

1.5 EARNEST MONEY DEPOSIT:

The tenderers are required to deposit EMD of an amount as notified in the tender notice (refundable) in the shape of Bank draft **/** Bankers Cheque from any Nationalized Bank/ Scheduled Bank drawn in favour of "Odisha Hydro Power Corporation Ltd., UIHEP, MUKHIGUDA" payable at IOB, Mukhiguda / SBI, ADB Branch, Jaipatna **/** in shape of Bank Guarantee **(BG)** issued from any Nationalized Bank/ Scheduled Bank in favour of OHPC, UIHEP, Mukhiguda executed in a non-judicial stamp paper worth **Rs.100/- (Rupees One Hundred) only** strictly as per Performa given in **Annexure-9 (B) of Section-V & encashable at a branch in Odisha** along with the tender documents, failing which the tender shall be out rightly rejected. The EMD amount will not carry any interest. The EMD of unsuccessful bidders shall be returned after finalization of tender. The EMD of successful tenderers shall be returned / refunded after submission of performance security deposit.

N.B.: Tender without EMD will be out rightly rejected and no further correspondences in this regard shall be entertained.

2.1 **CORRIGENDUM:** Modification of specifications and extension of closing date or opening date of Tender, if required, will be made by corrigendum. Copies of such corrigendum will be floated in OHPC website only. This shall be signed and shall form a part of the

Tender. Tenderers are required to visit the website for such corrigendum / errata / addendum if any.

2.2 **SUBMISSION OF BIDS:** The tenders are invited under two parts bidding system i.e. **Techno commercial Bid** and **Price Bid**. The interested agencies are advised to submit two separate sealed envelopes for each bid i.e. Techno commercial and price bid super scribing "Techno Commercial Bid for **DESIGN, MANUFACTURING, SUPPLY, ERECTION (INCLUDING UNLOADING & DRAGGING), TESTING & COMMISSIONING OF 01 NO. OF NEW 20 MVA, 220/33 KV POWER TRANSFORMER FOR UIHEP, MUKHIGUDA**" on the Techno Commercial Bid and super scribing "Price Bid for **DESIGN, MANUFACTURING, SUPPLY, ERECTION (INCLUDING UNLOADING & DRAGGING), TESTING & COMMISSIONING OF 01 NO. OF NEW 20 MVA, 220/33 KV POWER TRANSFORMER FOR UIHEP, MUKHIGUDA**" on the price bid addressing to Unit Head, UIHEP, Mukhiguda". Both the sealed envelopes should be kept in a third sealed envelope super scribing the tender No. & work i.e. "Tender for "**DESIGN, MANUFACTURING, SUPPLY, ERECTION (INCLUDING UNLOADING & DRAGGING), TESTING & COMMISSIONING OF 01 NO. OF NEW 20 MVA, 220/33 KV POWER TRANSFORMER FOR UIHEP, MUKHIGUDA**". Bidders shall quote their price as per the price bid format given in PART – II.

Bids shall be received in the Office of the Senior General Manager (El.), U.I.H.E.P, Mukhiguda as per tender notice. Bids received late due to reason whatsoever shall be rejected.

2.2.1 **PREPARATION OF BID**

The following Documents are to be submitted along with Techno-Commercial Bid in part-I in one sealed envelope.

2.1 Cost of Tender Paper and EMD in Shape of DD/BC.

2.2 **Self-attested** copies of MOA and AOA showing their legal status, place of registration & business and also manufacturing of transformers as their business.

2.3 **Self-attested** copy of GST Registration Certificate & IT PAN Card.

2.4 **Type Test Reports** of the same rated transformer or higher rating as tender, issued by Govt. or Authorized Testing Laboratory within last 5 years.

2.5 Drawings & Literatures of the tendered items.

2.6 A declaration by the tenderer that the tenderer has no relation with any employee serving under OHPC Ltd. **(Annexure-1)**

2.7 Checklist duly filled **(Annexure-2)**

2.8 An affidavit by the tenderer that the tenderer is not black listed **(Annexure-3)**

2.9 **Manufacturer's Authorisation Form (MAF) as in Annexure-4 duly filled (applicable only in case, the bidder is Manufacturer's Channel Partner).**

2.10 Signed tender specification as a token of acceptance to the terms and conditions of tender.

2.11 Deviation from Specification **(Annexure-6)**

2.12 Check list for qualifying requirements **(Annexure-7)**

2.13 Self-Certification towards Authentication of documents **(Annexure-8)**

2.14 Audited Balance sheet & profit loss accounts of the bidder for past 3 (three) years.

2.15 Data of previous executed orders for the tendered transformer rating or higher (both MVA &Voltage rating), indicating the customer's name, Purchase Order No. & Date, date of supply and date of commissioning etc. during the last 3 years **(Annexure-10)**.

2.16 Proforma for Performance Statement **(Annexure-11)**

2.16.1 **Annexure – 12 GUARANTEED TECHNICAL PARTICULARS (GTP)**, confirming to the Purchaser's Specification **duly filled.**

2.17 Details of Loss Calculation of Transformer **(Annexure-13)**

2.18 Specific Loss Curve and W/Kg Curve for the Core Materials

2.19 Check List towards Type Test Report **(Annexure-14)**

2.20 Calibration Status of instruments **(Annexure-15)**

3 Price bid in the prescribed format is exclusively for quoting of price only.

3.1 Price Bid Schedule-**1 (Schedule of Price Components)**

3.2 Price Bid Schedule-**2 (Mandatory Spares)**

3.3 Price Bid Schedule-**3 (Schedule of Spare Parts for 5 years O & M)**

3.3.1 Written Power of Attorney / Board Resolution in favour of the Authorized Signatory of the bid to submit the bid on their behalf.

Both the covers should be placed inside another sealed cover super scribed with TCN no. & marked as "**DESIGN, MANUFACTURING, SUPPLY, ERECTION (INCLUDING UNLOADING & DRAGGING), TESTING & COMMISSIONING OF 01 NO. OF NEW 20 MVA, 220/33 KV POWER TRANSFORMER FOR UIHEP, MUKHIGUDA".**

If the office happens to be closed on the date of receipt of the tender or on the opening date as specified in the tender notice, tenders will be received and opened on the next working day at the same time and venue.

1. No Post tender correspondence shall be entertained.
2. Modification of specification and extension of closing date and opening of tender if required will be made by issue of corrigendum / amendment / addendum.
3. All documents relating to tender shall be in the English language.
4. In case any tenderer wants to withdraw his tender before expiry of validity period and if the successful bidder fails to accept the order to supply the material after finalization of tender, then he shall be debarred from participation in any tender for a period of three years and action will be taken to blacklist the bidder.
5. Any request from the tenderer in respect of addition, alternation, modification, correction etc., either terms and conditions or rates of his tender after opening of the tender will not be considered.
6. Tenderers are expected to be fully conversant with the meaning of all the clauses of the specification before submitting their tenders. Failure to furnish all information, required by the Bidding documents or submission of a bid, not substantially responsive

to the Bidding Documents in every respect will be at the Bidder's risk and may result in the rejection of his bid. In case, any deviation is found in the tender document submitted by the tenderer from the content mentioned in our web site www.ohpcltd.com and/or non-submission of the cost of tender documents, the tender shall be liable to be rejected at any stage of the contract. The tenderer has to indemnify OHPCL for any loss accruing due to such alteration in the terms and conditions of the bid document & or for such alternation, resulting, in the cancellation of the contract.

7. **The tenderer should visit the site before submission of tender to check the site feasibility.**
8. The tenderer has to sign with seal in each pages of the tender specification and submit along with the technical bid as a token of acceptance of the tender specification.
9. Conditional offer shall not be accepted. Overwriting shall be signed. Erasures and other changes shall bear the dated initial of the person signing the tender.
10. The authority reserves the right to delete, alternate any of the tender specification at his option.
11. No tenderer will be permitted to furnish their tender in their own manuscript papers.
12. All tenders will remain valid for a period of **180 days** from the date of opening of tenders.
13. The rate should be quoted in **Indian Rupees** only.
14. The authority reserves the right to reject any or all the tenders without assigning any reason thereof.

3.4 CLARIFICATION & AMENDMENT

I) At any time before submission of bid, the client may, for any reason, modify the tender documents by amendment. The amendment, if any, shall be issued through an addendum which shall be kept in the official website of OHPC for information of the firms / agencies who intend to submit quotation. Before submitting the bid, the firms / agencies are advised to go through the website to find out such addendum / errata / corrigendum if any issued by the client. The addendum / errata / corrigendum will be binding on all the firms / agencies submitting the quotation. The client also reserves the right without any obligation or liability to accept or reject any or all the quotations at any stage of the process, to cancel or modify the process or any part thereof or to vary terms and conditions at any time without assigning any reason thereof.

II) Tenderers shall carefully examine the tender documents and the technical specification. Should a tenderer find any discrepancies or omissions from the specification or other documents, he should at once intimate the authority and obtain clarification in writing. This, however, does not entitle the tenderer to ask time beyond the due date fixed for receipt of tenders.

III) In case any bidder who has submitted the bid before issue of corrigendum / addendum etc., if desired can submit a bid superscribing as "revised bid against **TCN No. _____ Dated _____**" on the envelope containing the tender documents.

3.5 **OPENING OF TECHNO COMMERCIAL BID AND PRICE BID:** The Techno Commercial Bid shall be opened on the scheduled date and time as notified in tender notice at Office of the Sr. General Manager (El.), Upper Indravati Hydro Electric Project, At/Po – Mukhiguda, Dist – Kalahandi, Odisha in presence of the tenderer or authorized representative of the tenderer if any who wish to be present on that spot at that time. The price bid of only those tenderers will be opened who have qualified in the techno commercial bids. The date and time of opening of the price bids will be intimated only to the technically qualified firms before the due date of opening.

3.6 **EVALUATION:**

i) Evaluation shall be based on techno-commercial and price bids submitted by the bidders.

ii) The competent authority reserves the right to cancel any or all bids without assigning any reason thereof.

2. **Modification of Specifications:**

Modification of specifications, if required will be made by issue of corrigendum / amendment /addendum, which can be seen in the website www.ohpcltd.com up to the last date & time of sale of tender paper.

3. **Purchaser's Right to Accept / Reject Bids:**

The purchaser reserves the right to reject any or all the bids without assigning any reasons what so ever, if it is in the interest of OHPCL under the existing circumstances.

4. **Outright Rejection of Bids:**

Bids shall be out rightly rejected if the followings are not complied with –

i. The Tenderer should have downloaded the tender documents from website of OHPCL and shall have to deposit the tender paper cost, while submitting the bids.

ii. The bids shall be submitted in person or by Registered Post with A.D or by SPEED POST.

iii. The Bids shall not be submitted telegraphically, by Fax or by Email.

iv. The bids shall be kept valid for a minimum period of **180 (One Hundred Eighty) days** from the date of opening of bids.

v. The Bids shall be submitted in two parts, as specified.

vi. The schedule of price should be filled up fully to indicate the break-up of the prices including taxes and duties. Incomplete submission of this schedule will make the bids liable for rejection.

vii. The bidder not submitting the bid in line with the tender requirement.

viii. Conditional bid shall not be considered.

ix. Guaranteed Technical Particulars and Abstract of Terms and Conditions should be filled in properly.

1.6 ELIGIBILITY CRITERIA:

1.6.1 The bidder should be **Registered Manufacturers/ Manufacture's Channel Partner** and should have executed similar types of Works / Orders in the last **05 (five) years** as on the date of opening of tender.

1.6.2 In case the bidder is **Manufacturer**, they should have **manufactured** & have the successful experience of "**SUPPLY, ERECTION, TESTING & COMMISSIONING**" of transformer of **similar or above capacity (both MVA & Voltage rating)** to Govt. / Central PSU / State PSU/ Power Utility **in last 5 years** and shall have **successful performance for 3 years** from date of commissioning. **Copies of work orders & Performance certificate from the user in this regard should be furnished**. The manufacturer should have conducted type tests on the tendered equipments of **similar or above capacity** in Government approved laboratory within **last seven years** from the date of opening of the tender.

1.6.3 In case the bidder is **Manufacturer's Channel Partner**, the manufacturer must have the experience **as per the above clause**. The bidder shall also have to submit the Manufacturer's Type Test certificate wherein, the type tests must have been conducted on the tendered equipments of **similar or above capacity** in Government approved laboratory within **last seven years** from the date of opening of the tender. The bidder must also furnish the **Manufacturer's Authorisation** as per the **Annexure-4**.

1.6.4 In all of the above cases, **the Manufacturer shall depute their authorised service engineer to site for Erection, Testing & Commissioning of the transformer.**

1.6.5 Documentary evidence in support of the above eligibility criteria must be submitted.

1.6.6 **Those who do not have the above requisite eligibility criteria need not apply.**

1.6.7 **Bids not confirming to the eligibility criteria shall be out rightly rejected.**

General: -

a) The bid shall be typed or written in indelible ink, serially numbered and signed by the Bidder or a person or persons, duly authorized to sign the bid. The letter of authorization, accompanied by a written power-of-attorney (In non-judicial stamp paper) shall be enclosed in the bid. All pages of the bid, except for un- amended literature, shall be initiated by the person or persons, signing the bid.

b) All pages, including literature, type test report etc. of the bid should be numbered and page number should be continuous.

c) The bid shall contain no interlineations, erasures or over writing except as necessary to correct errors, made by the Bidder in which case such corrections shall be initiated by the person or persons, signing the bid.

d) In the event of discrepancy or arithmetically error in the schedule of price, the decision of the purchaser shall be final and binding on the Tenderer.

e) For evaluation, the price mentioned in words shall be taken if there is any difference in figures and words in the price bid.

f) Notice Inviting Bids shall form part of this specification.

g) The price bids of the techno-commercially and otherwise acceptable bids shall only be evaluated.

h) The person, signing the bids should sign on each page of the bids paper in acknowledgement of having gone through the entire Bids Specification and in agreement thereof. Bids papers, not signed on each page with official seal by the Bidders, and shall not be considered.

i) It should be distinctly understood that the price bid shall contain only details /documents, relating to price, mentioned herein above. Inclusion of any other documents / information etc. shall render the bid liable for rejection.

Disclaimer: -

This document may include information / statements based on various assumptions which the purchaser does not claim to be either accurate or complete. Bidders are expected to check and conduct independent analysis in their own interest. The purchaser will not have any liability whatsoever to any bidder for any loss, expense or damage arising out of or in connection with anything contained in or interpreted from this document.

Sd/-
Unit Head
UIHEP, MUKHIGUDA

SECTION – II
General Terms & Conditions

GENERAL TERMS AND SPECIAL CONDITIONS

1. **SCOPE OF CONTRACT**: **DESIGN, MANUFACTURING, SUPPLY, ERECTION (INCLUDING UNLOADING & DRAGGING), TESTING & COMMISSIONING OF 01 NO. OF NEW 20 MVA, 220/33 KV POWER TRANSFORMER FOR UIHEP, MUKHIGUDA** as per details mentioned in the Technical Specifications along with **transformer oil of requisite quantity with 10% extra as well as supply of mandatory spares** to be specified clearly by the Manufacturer / manufacturer's channel partner. It also includes Type Test (if not done earlier), inspection, loading at factory, transportation to and unloading at Site with guaranteed obligation. Required road permit for transportation shall also be arranged by the supplier.

2. **DEFINITION OF TERMS**:

For the purpose of this specification and **General Terms & Conditions of Contract [GTCC]**, the following words shall have the meanings hereby indicated, except where otherwise described or defined.

"**The Purchaser**" shall mean the **Unit Head, UIHEP, Mukhiguda** for and on behalf of ODISHA HYDRO POWER CORPORATION LIMITED.

"**The Engineer"** shall mean the Engineer appointed by the Purchaser for the purpose of this contract."

"**Purchaser's Representative**" shall mean any person or persons or consulting firm appointed and remunerated by the Purchaser to supervise, inspect, test and examine workmanship and materials of the equipment to be supplied.

"**The Supplier**" shall mean the bidder whose bid has been accepted by the purchaser and shall include the bidder's executives, administrators, successors and permitted assignees.

"**Equipment**" shall mean and include all machinery, apparatus, materials, and articles to be provided under the contract by the suppliers.

"**Contract Price**" shall mean the sum named in or calculated in accordance with the provisions of the contract as the "Contract Price" which shall include packing, forwarding, freight, insurance, GST, Entry Tax and any other taxes and duties as applicable at the time of opening of the bid.

"**General Condition**" shall mean these General Terms and Conditions of Contract.

"**The Specification**" shall mean both the technical as well as commercial parts of the specification, annexed to or issued with GTCC and shall include the schedules and drawings, attached thereto as well as all samples and pattern, if any.

"**Month**" shall mean "Calendar month".

"**Writing**" shall include any manuscript, type written, printed or other statement reproduction in any visible form and whether under seal or under hand.

"**FOR Destination Costs**" shall mean the cost of equipment and material at the consignee's store/site. The cost is exclusive of GST, but is inclusive of packing, forwarding, freight & insurance, loading & unloading charges.

The term "**Contract Document**" shall mean and include GTCC, specifications, schedules, drawings, form of bids, Notice Inviting Bids, covering letter, schedule of prices or the final General Conditions, any special conditions, applicable to the particular contract and amendments if issued.

Terms and conditions not herein defined shall have the same meaning as are assigned to them in the Indian Contract Act, failing that in the Orissa General Clauses Act.

3. MANNER OF EXECUTION:

All equipment supplied under the contract shall be manufactured in the manner, set out in the Specification or where not set out as per relevant standards and to the reasonable satisfaction of the Purchaser's representative.

4. DESTINATION: Central Store under Divisional Head, Operation Division **or** directly at 220 KV switchyard of UIHEP, Mukhiguda as per the instruction of site authority.

5. NATURE OF PRICE, TAXES & BASIS OF PRICE VARIATION:

5.1 Taxable base value of transformer including oil is variable strictly as per IEEMA PV Regulations bearing Circular No. 140/PVC/DT-PT/05, dated 10th November'2021, a copy of which is attached with the tender. The base value of the transformer is exclusively of the transformer with oil only, charges towards freight & insurance, loading & unloading, packing & forwarding etc. are excluded from PV formula and hence shall have to be quoted separately strictly in the format given in Price bid schedule-1 attached with this specification.

5.2 The quoted price for mandatory spares, five years O & M spares, Erection, Testing & commissioning charges of the transformer at site and inspection charges, if any, shall be FIRM and strictly non-variable throughout the pendency of the tender & subsequent placement of orders on the successful bidder. Bidders should carefully read the tender stipulation before submitting their quotation.

5.3 For the purpose of calculation of PV, the base date shall be reckoned as date of issuance of this office NIT and various indices given in the IEEMA Circular for voltage level above 33 kV up to 400 kV shall be calculated as per stipulated provisions therein. The end date for calculation shall be reckoned as date of dispatch of the transformer along with all its accessories, oil & spares. The values of various indices for the end date shall be calculated in the manner as described in the IEEMA Circular for voltage level above 33 kV up to 400 kV.

5.4 GST for the entire contract price shall be paid extra at the time of invoicing as per the applicable rate & rules prevailing on the date of invoicing. Income tax as applicable as per CBDT Rules shall be deducted from the invoices of the successful bidder and TDS certificate, if so desired, shall be issued to that extent. Any other taxes and duties such as local taxes beyond GST, entry taxes, electrical inspection fee (if so required) shall have to be borne by the bidders and the price quotation should be made accordingly. Any claims for

reimbursement of such local taxes and/or inspection fees by the successful bidder shall not be entertained under any circumstances. The prospective bidders are advised to make their own assessment of such local taxes/fees and quote their price offers accordingly, fully being aware that any request for reimbursement of such levies afterwards shall not be entertained by OHPCL. The successful bidder shall at all the time keep OHPCL harmless from any levy of local taxes /fees arising out of this contract, except for those provided under GST Rules.

Any tax and /or levies /fees payable by the bidders to their sub-contractors /channel partners, if any, in respect of transactions between the bidders and their vendors/sub-suppliers while procuring any input materials and/or services shall be deemed to have been taken into consideration while quoting the offers by the prospective bidders and OHPCL shall neither reimburse any such claims, nor interested in those affairs whatsoever.

5.5 No revision of quoted prices shall be allowed after opening of bids, except if, and only if, OHPCL varies the scope of work under extraordinary circumstances & asks the bidders to do the same. After opening of the price bids, if validity period is not enough to fructify the tender, the participating bidders may be asked by OHPCL for further extension of validity period, usually with same terms & conditions, but the bidders are allowed to revise their quoted prices, if they wish so, at their own risk & responsibilities.

6. PROPER FILLING UP OF THE PRICE SCHEDULE:

The tenderer should fill up the **Price Bid (Schedule-1, 2 & 3)** properly and in full. The bids may be rejected if the schedule of price is submitted in incomplete form. The nature of price indicated in this Specification shall be final and binding.

7. THE PRICE BID SHALL ACCOMPANY WITH THE FOLLOWING DOCUMENTS:

i. Schedule of Price components (**Price Bid Schedule-1)**.
ii. Prices of mandatory spare parts (**Price Bid Schedule-2).**
iii. Schedule of spare parts for five years of normal O & M (**Price Bid Schedule-3)**.

8. EARNEST MONEY DEPOSIT (EMD): The tenderers are required to deposit EMD of an amount as notified in the tender notice (refundable) in the shape of Bank draft / Bankers Cheque from any Nationalized Bank/ Scheduled Bank drawn in favour of "OHPC Ltd., UIHEP, MUKHIGUDA" payable at IOB, Mukhiguda / SBI, ADB Branch, Jaipatna along with the tender documents, failing which the tender shall be out rightly rejected. The EMD amount will not carry any interest. The EMD of unsuccessful bidders shall be returned after finalization of tender. The EMD of successful tenderers shall be returned / refunded after submission of performance security deposit.

N.B.: Tender without EMD will be out rightly rejected and no further correspondences in this regard shall be entertained.

9. SECURITY FOR PERFORMANCE/ PERFORMANCE SECURITY DEPOSIT: The successful bidder shall have to deposit **10%** of the ordered amount towards security for performance in shape of Bank draft/ Bankers Cheque issued from any Nationalized Bank/ Scheduled Bank drawn in favour of **"**OHPC Limited, UIHEP, Mukhiguda", payable at SBI, Jaipatna or in shape of Composite Bank Guarantee issued from any Nationalized Bank executed in a non-judicial stamp paper worth **Rs.100/- (Rupees One**

Hundred) only strictly as per Performa given in **Annexure-9 of Section-V & encashable at a branch in Odisha** within **21 days** of issuance of LOI / Purchase Order. **The confirmation letter of the concerned Bank should be sent along with Bank Guarantee.** In the event of any breach or default in all or any of the conditions set forth and provided in the purchase order, OHPC may forfeit the whole amount of Security deposit.

i) The Security B.G. should remain valid **beyond 03 months of the end of the guarantee period**.

ii) The BG should be **revalidated** as and when intimated to cover the entire Guarantee Period.

iii) No interest is payable on the security amount. In case of non-fulfilment of contractual obligation as required in the detailed purchase order, the security deposit shall be forfeited.

iv) Security deposit shall be released **after 3 months** from the date of completion of the Guarantee Period.

10. IMPORT LICENSE: In case, imported materials are offered, no assistance will be given for release of Foreign Exchange. The firm should arrange to import materials from their own quota. OHPC Ltd will pay in INR & assume no responsibility whatsoever on this account.

11. SUPPLIER TO INFORM HIM-SELF FULLY:

The supplier shall examine the instructions to tenderers, general conditions of contract, specification to satisfy himself as to all terms and conditions and circumstances affecting the contract price. He shall quote price[s] according to his own views on these matters and understand that no additional allowances except as otherwise provided there in will be admissible. The purchaser shall not be responsible for any misunderstanding or incorrect information, obtained by the supplier other than the information given to the supplier in writing by the purchaser.

12. PATENT RIGHTS ETC: -

The supplier shall indemnify the Purchaser against all claims, actions, suits and proceedings for the infringement or alleged infringement of any patent design or copy right protected either in the country of origin or in India by the use of any equipment supplied by the manufacturer/ manufacturer's channel partner, but such indemnity shall not cover any use of the equipment, other than for the purpose indicated by or reasonably to be inferred from the specification.

13. DELIVERY/ COMPLETION PERIOD:-

13.1 The zero date of the contract to be entered into with the successful bidder by OHPCL, shall be treated as **date of issue of purchase order** by OHPCL on receipt of **Advance Payment Bank Guarantee** in the prescribed format & conditions as per the attached format with this specification for required value & validity verification by UIHEP site authorities and receipt of Performance Bank Guarantee in the prescribed format

attached with this specification for required value and validity as described in the "Terms of Payment" Clause under Section-III of the specification by UIHEP Site authorities, all conditions satisfied.

13.2 The successful bidder shall have to submit **Advance & Performance BG** to UIHEP site authorities **within 21 days** of issuance of the purchase order by UIHEP, Mukhiguda.

13.3 The successful bidder shall have to submit the requisite drawings as required under this specification to UIHEP site within **45 days** of release of advance payment, seeking approval of UIHEP site authorities.

13.4 Within **15 days** from receipt of drawings from the successful bidder, UIHEP site authorities shall have to communicate drawing approval, with or without any comments, as the case may be as per technical requirements /analysis commensurate with site conditions written /corrected on the body of the drawings of the firm on running hand with red ball point pen. The successful bidder shall have to acknowledge receipt of the corrected & approved drawings from UIHEP site authorities and make necessary changes to the design and accordingly submit the as-built drawings to the UIHEP site authorities in the manner & number of copies described in this specification.

13.5 All other assignments including invitation for factory tests as described in this specification strictly in accordance with IS: 2026/2011 Part-I, II & III, IS: 335 and IEC: 60076, Part-3 and other relevant standards, conditions of routine /special tests at factory & other tests at site, approval of test reports, issuance of dispatch instruction, transportation of the new Transformer along with oil and all other accessories & spares to the UIHEP site, receipt of the materials /equipment at site in good condition, conduction of site tests, erection, testing and successful commissioning of the Transformer, shall have to be completed in all respect **within 09 (Nine) months from the date of issuance of approved drawings** by UIHEP site authorities to the successful bidder.

13.6 Prospective (s) bidders are encouraged to squeeze the time line as much as practically possible. A tentative bar chart showing different activities from commencement of schedule till successful commissioning may be enclosed with the respective bid(s) for the purpose of reference.

13.7 **ERECTION, TESTING & COMMISSIONING:**

i) Erection, Testing & Commissioning of each individual transformer shall be completed **within 30 days** from the date of site clearance / site hand over / permission by Engineer-In-Charge for Erection, Testing & Commissioning issued to the firm for each transformer.

ii) The Erection, Testing & Commissioning work shall be carried out by **HT Electrical Contractor holder / HT supervisor licence holder issued by Appropriate Electrical Licensing Authority. In case supervisor licence is submitted, the bidder shall furnish supervisor's willingness**.

iii) Date of issue of permission will be intimated to the firm **one week in advance**.

iv) For commissioning of transformers, necessary clearance from electrical inspector shall be arranged by the successful bidder. However, all possible cooperation for obtaining clearance from electrical inspector/ ELBO shall be

extended by OHPC. Time taken for obtaining clearance from Electrical Inspector shall not be counted towards completion period.

14. **DISPATCH INSTRUCTIONS**: **After approval of Inspection & Test reports, the dispatch instruction shall be issued.** After issue of dispatch instruction, the materials should be securely packed and dispatched duly insured directly to the destination i.e. Power House under Divisional Head, Operation Division, UIHEP, Mukhiguda at the supplier's risk by Rail/ Road Transport.
15. **PACKING FORWARDING, FREIGHT, TRANSIT INSURANCE, LOADING & UNLOADING OF ORDERED MATERIALS**:-
    It will be the sole responsibility of the supplier for packing & forwarding, freight, transit insurance, loading and unloading of materials both at the factory site and at the destination site/store. The Purchaser shall have no responsibility on this account.
16. **E-WAY BILL:** E-Way Bill (if required) will have to be arranged by the successful bidder.
17. **EXTENSION OF TIME:** If the delivery of equipment/material is delayed due to reasons beyond the control of the supplier, the supplier shall give notice to the purchaser in writing of his claim for an extension of time **within 7 days of occurrence of such force majeure events**. The purchaser on receipt of such notice may agree to extend the contract delivery date as may be reasonable but without prejudice to other terms and conditions of the contract.
18. **CONTRACT AGREEMENT:** In case of both supply & service (Supply, erection, testing & commissioning,) the successful bidder shall have to execute an agreement in a non-judicial stamp paper worth as applicable as per Odisha Stamp Duty Act as per the prescribed forms of Govt. of Odisha with the **Engineer-in-Charge (EIC)** of UIHEP, Odisha Hydro Power Corporation Ltd. **within 15 days of issue of order**, before supply and execution of the work to be executed for the contract, failing which the order will be treated as cancelled.
19. **TERMS OF PAYMENT**:
    - **10% of the contract price excluding ERECTION, TESTING & COMMISSIONING (Excluding GST)** i.e. **for supply part only**, shall be released **as advance payment** against GST advance invoice/ advance receipt voucher within **21 days** of placement of purchase order against submission of an advance payment bank guarantee of **110%** of the advance payment (e.g. if the absolute figure of advance payment is Rs.50 Lakh, then the successful bidder shall have to submit an advance payment BG amounting to a value of Rs.55 Lakh) with **validity till successful commissioning** of the Transformer at UIHEP site and certification thereof.

      Release of advance payment is **further subject to submission of Performance Bank Guarantee (PBG)** and **signing the contract agreement as per clause No. 18 (CONTRACT AGREEMENT).**

      However, the prospective bidder (s) may opt out of advance payment and seek 100% payment after successful commissioning of the transformer at UIHEP site.
    - **80%** payment of the contract price along with 100% GST as applicable shall be released against **satisfactory receipt of all the materials (transformer along with accessories) at site and on submission of relevant /required documents**.

- **Balance 10%** of the contract price excluding GST for **supply part** & 100% of contract price of **Erection, Testing & Commissioning** charges along with 100% GST as applicable for Erection, Testing & Commissioning charges shall be released **after successful commissioning of the transformer at site and certification thereof by E.I.C**. **However, the balance 10% of the contract price excluding GST for supply part may be released, if the site could not be handed over by OHPC to the successful bidder within the completion of guarantee period.**
- The prescribed formats for advance payment BG and performance BG are attached herewith this tender Specification.
- No interest is payable on any of the Bank Guarantee by OHPCL to the successful bidder.
- The bank guarantee should be executed on non-judicial stamp paper of worth not less than Rs. 100/- (Rupees one hundred) only drawn on any of the nationalized bank.
- The advance payment shall be adjusted proportionately against the subsequent bills.
- All payments shall be made through RTGS/NEFT and procedures of the instruments shall be followed as per banking rules.

20. **TDS/ TCS**: TDS/ TCS as applicable (As per IT Act & GST Act) shall be deducted from the payables to the successful bidder.

21. **TAXES**:

i) Only GST as applicable shall be paid extra.

ii) The GST and entry tax if any, and any other levies, payable by the bidders in respect of transaction between the bidders and their vendors/sub-suppliers while procuring any component, sub-assemblies, raw materials and equipment shall be included in the bid price and no claim on this behalf will be entertained by the purchaser.

22. **GUARANTEE PERIOD:**

The transformer along with all its accessories and spares, covered by this specification should be guaranteed for satisfactory operation and against defects in design, materials and workmanship for a period of **at least 30 (thirty) months from the date of delivery or 24 [twenty-four] months from the date of commissioning, whichever is earlier**. The date of commissioning shall be the date from which the equipment is in satisfactory operation. The last date of delivery shall be the date on which the transformer along with all its accessories and spares are received at OHPCL's stores / site in complete shape and good conditions, substantiated with verification certificate by OHPCL which are released for Dispatch by the purchaser after due inspection.

The above **guarantee certificate** shall be furnished **in triplicate** to the purchaser for his approval. Any defect noticed during this period should be rectified by the supplier free of cost to the purchaser provided such defects are due to faulty design, bad workmanship or bad materials used, within one month upon written notice from the purchaser, failing which provision of **Clause-22(b) shall apply**.

Equipment along with all its accessories and spares failed or found defective during guarantee period shall have to be guaranteed after repair/replacement for a further period of **24 months from the date of commissioning or 30 months from the date of delivery** at UIHEP, Mukhiguda stores/ site in complete shape and good conditions, after such repair/replacement whichever is earlier. Date of receipt as used in this clause shall mean the date on which the transformer along with all its accessories and spares are received at UIHEP, Mukhiguda stores / site in complete shape and good conditions.

23. PENALTY FOR DELAY IN COMPLETION OF THE CONTRACT:

- If the supplier **fails to deliver** the materials, or **fails to complete erection, testing & commissioning** within the time period specified in the contract or any extension granted there to, the purchaser shall recover from the supplier liquidated damage **@ 0.5% of the contract price** for each calendar week or part thereof of delay.
- For the purpose of date of completion of delivery, the date of receipted challan shall be recorded as the date of delivery.
- Equipment will be deemed to have been delivered only when all its components, accessories and spares as per technical Specification are delivered in full & good condition. If certain components, accessories and spares are not delivered in time, the delivery of equipment will be considered delayed until such time as the missing parts are delivered.
- For the purpose of completion of erection, testing and commissioning work, the date of commissioning of Transformer set shall be recorded as the completion date for erection, testing and commissioning work for Voltage Transformers set.
- The total amount of liquidated damage shall not exceed **5% (Five percent)** of the total contract value.

24. FORCE MAJEURE: The supplier shall not be liable for any penalty for any delay or for failure to perform the contract for reasons of force majeure such as act of God, acts of public enemy, fire, flood, epidemic, quarantine restrictions, strikes, freight embargoes and provided that the supplier shall **within 7 days** from the beginning of such delay, notify UIHEP authorities in writing of the cause of delay. UIHEP shall verify the facts and grant such extension, if justified without any financial obligation on OHPC.

25. INSPECTION AND TESTING:

The purchaser's representative shall be entitled at all reasonable times during manufacture to inspect, examine and test at the supplier's premises, the materials and workmanship of all equipment to be supplied under this contract and if part of the said equipment is being manufactured in other premises, the supplier shall obtain for the purchaser's representative permission to inspect, examine and test as if the equipment were being manufactured in the supplier's premises. Such inspection, examination and testing shall not relieve the supplier from his obligations under the contract.

The supplier shall give to the purchaser adequate time/notice **[at least 30 days]** in writing for inspection of materials indicating the place at which the equipment is ready for testing and inspection and shall have calibration certificates of Testing instruments, calibrated in Govt. approved laboratory with authenticity letter of that laboratory, along with offer for inspection to the Purchaser. A packing list along with the offer indicating the quantity which can be delivered through suitable rail/road transport to facilitate issue of dispatch instruction shall also be furnished.

Where the contract provides for test at the premises of the supplier or any of his sub-vendors, the supplier shall provide such assistance, labour, materials, electricity, fuel and instruments, as may be required or as may be reasonably demanded by the Purchaser's representative to carry out such tests efficiently. The supplier is required

to produce routine test Certificate, calibration certificates of Testing Instruments before offering their equipment for inspection and testing. The test house/ laboratory where tests are to be carried out should be approved by the Govt. approved laboratory which should be furnished to the purchaser along with the offer for inspection.

After completion of the tests, the Purchaser's representative shall forward the test results to the Purchaser. If the test results conform to the specific standard and specification, the Purchaser shall approve the test results and communicate the same to the supplier in writing. The supplier shall provide **at least FOUR copies** of the test certificates to the Purchaser.

The Purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is dispute regarding the quality of supply.

In case, the transformer is not presented for inspection (stage or final) on the date of inspection, offered by the firm due to any reason(s), the firm shall be required to bear the actual expenses, incurred in the visit of the Inspector(s). Any cost, incurred towards repetition of tests and Inspection shall be to the account of the supplier.

26. TRAINING FACILITIES:

The supplier shall provide all possible facilities for training of Purchaser's Technical personnel, when deputed by the Purchaser for acquiring first-hand knowledge in assembly of the equipment, inter section, commissioning and for its proper operation and maintenance in service, wherein it is thought necessary by the purchaser.

27. REJECTION OF MATERIALS:

In the event, any of the equipment supplied by the manufacturer/ manufacturer's channel partner is found defective due to faulty design, bad workmanship, bad materials used or otherwise not in conformity with the requirements of the Specification, the Purchaser shall either reject the equipment/ material or ask the supplier in writing to rectify or replace the defective equipment free of cost to the purchaser. The supplier on receipt of such notification shall either rectify or replace the defective equipment/material free of cost to the purchaser within 30days of the date of such notification by the purchaser. If the supplier fails to do so, the purchaser may: -

At its option replace or rectify such defective equipment / materials and recover the extra costs so involved from the supplier plus fifteen percent and /or terminate the contract for balance work/supplies, with enforcement of penalty Clause as per contract for the un- delivered goods and with forfeiture of Performance Guarantee/Composite Bank guarantee. Acquire the defective equipment /materials at reduced price, considered equitable under the circumstances.

28. TENDERER'S DEFAULT LIABILITY: OHPC may write notice of default to the tenderer and may terminate the contract in circumstances as mentioned below.

a) If the supplier fails to make delivery of the material in complete shape within the time specified.
b) If the supplier fails to comply with any of the provisions of this contract.
c) If any additional cost incurred by OHPC for the complete supply, the supplier will be liable for payment of such cost and penalty for delay.

29. **SUPPLIER'S RESPONSIBILITY:** Not-withstanding anything mentioned in the Specification or subsequent approval or acceptance by the Purchaser, the ultimate responsibility for design, manufacturing, materials used and satisfactory performance shall rest with the Supplier. The supplier shall be responsible for any discrepancy noticed in the documents, submitted by them along with the bid(s).

30. **PAYMENT DUE FROM THE SUPPLIER:-** All costs and damages, for which the supplier is liable to the purchaser, will be deducted by the purchaser from any money, due to the supplier under any of the contract(s), executed with OHPCL.

31. **DEVIATION FROM SPECIFICATION:-** It is the interest of the tenderer to study the specification, thoroughly before tendering so that if any deviations are made by the tenderer the same are prominently brought out in their tender in the form of Deviation Statements (Annexure-6).

32. **EXPERIENCE OF TENDERERS**:

The tenderer should furnish information regarding experience particularly on the following points (Annexure-VIII):

i) Name of the manufacturer/ manufacturer's channel partner:
ii) Rating of Transformer, quoted:
iii) Description of the transformers, quoted, supplied and installed with the names of the Organizations to whom supplies were made along with Purchase Order No. & Date, wherein, ***at least 1 (one) certificate shall be from a State / Central P.S.U.***
iv) Details as to where installed and commissioned, as per the above Qualifying Requirement.
v) Testing facilities at manufacturer's works.
vi) A list of purchase orders of the same rated Transformer, as offered as per technical specification or higher rating (both MVA & Voltage rating) along with user's certificate, as applicable in accordance with the above Qualifying Requirement of this Specification. User's certificate shall be legible and must indicate user's name, address, Telephone & FAX No. and designation, place of use and satisfactory performance of the Transformers for a period, as stipulated in the above Qualifying Requirement, from the date of commissioning. Bids will not be considered, if the past manufacturing experience is found to be unsatisfactory or is of less than the period, as stipulated in the Qualifying Requirement of this Specification, on the date of opening of the bid and bids, not accompanying user's certificates will be rejected.

33. **EVALUATION**:

TECHNO-COMMERCIAL BID: -All the bids, which are opened, read out and considered for evaluation will be checked for qualification requirements as per Clause No. 36 and stipulations in outright rejection clause of the specification. Such of the bid(s), which do not meet the qualification requirements and stipulations as per outright rejection clauses, will not be evaluated further. The bid is to be checked for its conformity to the technical specification. If it does not meet the technical specification, the bid will not be evaluated further. However, if in the opinion of the purchaser, the bidder

has offered equipment/material better than that, specified in the technical specification; the same may be taken into consideration.

Further, the purchaser may enquire from the bidder in writing for any clarification on the bid subject to the bidder meets the qualification requirements and stipulations as per outright rejection. The response of the bidder will also be in writing. However, no change in the prices or substance of the bid will be sought, offered or permitted.

PRICE BID: - Evaluation of price bids will be on the basis of the FOR-DESTINATION PRICE (By Rail/ road Transport) including Taxes and duties etc. & commissioning & testing, charges as may be applicable. The FOR-Destination PRICE shall consist of the following components

- Ex-works price of the 20 MVA, 220/33 KV Power Transformer as per specification including oil and other accessories at UIHEP, Mukhiguda, Odisha including unloading charges.
- Packing and Forwarding, Freight & Insurance
- GST
- Other statutory levies, if any
- Mandatory spares
- Loading towards capitalization of losses to be derived as per Technical Specification **(Annexures for Loss calculation & GTP).**
- Erection, Testing & Commissioning of new 20 MVA, 220/33 KV Power Transformer at UIHEP, Mukhiguda, Odisha including Dragging charges including GST.
- Discounts offered, if any, by the Bidder shall also be considered provided the same is submitted along with price bid and it is provided on unit Ex-works price and/or packing & forwarding charges, which will be applicable irrespective of tendered / ordered quantity. However, conditional discounts will not be considered.
- In case of mandatory spares, if no price is mentioned for any item(s), the bid will be loaded with the maximum price, quoted by the other bidder. However, while placing orders, such mandatory spares would be deemed to have been offered free of cost.

N.B.:

(i) The purchaser's evaluation of a bid will exclude and not consider any allowance for price adjustment during the period of execution of the contract, if provided in the Bid.

(ii) Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price will be corrected. If there is a discrepancy between the Total Bid Amount and the sum of the total prices, the sum of the total prices shall prevail and the total bid amount will be corrected.

34. AWARD OF CONTRACT:

The purchaser will award the contract to the bidder whose bid is determined to be substantially responsive to the bidding documents and who has offered the lowest evaluated bid price for the complete work, provided further that the bidder has the

capability and resources to carry out the contract effectively to the optimum satisfaction of the purchaser.

The customer reserves the right to accept or reject any bid or part thereof and to alter the bidding process and reject all bids at any time prior to award of contract without assigning any reason thereof.

In the interest of work, the Purchaser reserves the right to relax any terms and conditions without affecting the quality & price of the equipment.

35. **LANGUAGE AND MEASURES**: All documents pertaining to the contract including specification, schedule, notices, correspondences, operating and maintenance manual, drawings and any other writing shall be written in ENGLISH language. The METRIC system of measurement shall be used exclusively in this contract.

36. **QUALIFYING REQUIREMENT OF BIDDER (QR):**

a. The bidder should have manufacture and supply experience of the rating as tendered or higher capacity Power Transformers (both MVA & Voltage rating) in last 5 (Five) years as on the date of opening of the Techno-Commercial bid.

b. At least 3 (Three) Nos. of Power Transformers of rating, as tendered or higher capacity (both MVA and Voltage rating) should have been **supplied with erection, testing & commissioning successfully** within the above period (Documentary evidence to be provided).

c. The rating, as tendered or higher capacity (both MVA and Voltage rating) transformer(s) supplied by the bidder should have at least **3 years successful performanc**e from the date of commissioning (Documentary evidence to be provided).

d. The tenderer should have adequate infrastructural facility for **"after sales service" (Description of service network is to be given)**.

e. The bidder shall furnish type test reports with his bid. All type tests conducted on the rating (both MVA and voltage class) or higher capacity (both MVA & voltage rating) shall be as per relevant standard in a Govt. of India recognized laboratory. The date of type test **shall not be earlier than seven years** as on the date of bid opening. The bids, received without type test reports may be treated as non-responsive.

f. Copies of documents, defining the constitution or legal status, place of registration and principal place of business of the company shall be furnished along with the bid (MOA /AOA/ Registration /License issued by Govt. Authority).

g. Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have

i. Made misleading or false representations in the forms, statements and attachments, submitted in proof of qualification requirements and/ or

ii. Record of poor performance such as not properly completing the contract, inordinate delays in completion of supply, litigation history or financial failure etc.

h. Not-withstanding anything stated above, the purchaser reserves the right to assess the Bidder's capability and capacity to perform the contract within the scheduled time, should circumstances warrant such assessment in the overall interest of the Purchaser.

37. TEST CERTIFICATE:

Type Test results as per relevant IS of the same rated transformers or higher ratings conducted **during last 5 years** from the date of opening of this tender, shall be submitted along with the Technical Bid. Routine and acceptance tests on the equipment to be supplied, shall be submitted by the supplier after inspection & testing at Manufacturer's Works, after which the Dispatch Clearance shall be issued for delivery of materials.

38. INSURANCE:

Insurance of the materials / equipment covered by the specification should normally be done by the suppliers with their own insurance company unless otherwise stated. The responsibility of delivery of materials / equipment at destination, stores / site in good condition rests with the suppliers. Any claim of the insurance company or Transport Agency arising due to loss of damage in transit has to be settled by the supplier. The supplier shall undertake free replacement of materials / equipment damaged or lost which will be reported by the consignee within 30 days of receipt of materials / equipment at destination without awaiting settlement of their claims with the carriers & underwriters.

39. TECHNICAL PARTICULARS: The tenderers are requested to furnish the following Technical Particulars with the Technical Bid;

a) Type Test reports
b) Drawings
c) Literature / Leaflets of the items if any
d) Manual for erection, testing, operation and maintenance

40. CORRESSPONDENCE: Any notice to the tenderer under the terms of conditions shall be served by OHPC by Email / Registered Post / Speed Post and all the correspondences regarding this specification should be addressed to: -

Office of the Senior General Manager (El.), UIHEP, Mukhiguda, Dist: Kalahandi, Odisha, Pin-766026. (Email: sgmel_uihep@ohpcltd.com)

41. ENCLOSURES: All the schedules and proformas are enclosed to this specification in Section V and other forms.

42. JURISDICTION OF THE HIGH COURT OF ODISHA: Suits if any, arising out of this contract shall be filed by either party in a Court of Law within the jurisdiction of Hon'ble High Court of Odisha only. It shall be expressly agreed that neither party shall be competent to bring suit in this regard at any place outside the State of Odisha.

43. STATUTORY COMPLIANCE: The bidder is responsible for compliance of Rules & Codes such as minimum wage act, Industrial Dispute Act, Factory Act, EPF & ESI Act, Bonus Act, Fair Wages Act, labour laws, I.E. Rules, workmen compensation and other Rules etc. as amended by the Govt. from time to time for execution of contract. OHPC is not responsible in this regard.

Sd/-
Unit Head
UIHEP, Mukhiguda

SECTION – III
SPECIAL TERMS AND CONDITIONS

1. **CONSIGNEE :-** Divisional Head, Operation Division, UIHEP, Mukhiguda, OHPC Ltd., Dist.-Kalahandi-766026 (Odisha). If the material supplied by the supplier is found defective / not suitable for use, the consignee shall either reject the material or request the supplier in writing to replace the same.
2. **ENGINEERING-IN-CHARGE (EIC)/ VERIFYING OFFICER :-** Divisional Head, P&C Division, UIHEP, Mukhiguda.
3. **PAYING OFFICER:-** Finance Wing Head, UIHEP, Mukhiguda.

SECTION – IV

SCOPE & TECHNICAL SPECIFICATION

4.1 **SCOPE:** The scope covers **SUPPLY, ERECTION, TESTING & COMMISSIONING (INCLUDING UNLOADING & DRAGGING) OF 01 NO. OF NEW 20 MVA, 220/33 KV POWER TRANSFORMER FOR UIHEP, MUKHIGUDA** as per Technical Specification. Supply of any other material or any other work required for successful execution of erection, testing & commissioning of above-mentioned Transformers, not specifically mentioned in the tender specification are deemed to be included in the scope of work.

The scope also includes the work and supply of materials required for commissioning of the transformers in the existing system.

The supplied new Transformer shall be commissioned at 220 KV Switchyard of Upper Indravati Hydro Electric Project, Mukhiguda or any other place as directed by the Engineer-in-Charge. Supply, Erection, Testing and Commissioning shall be taken up in turnkey basis.

The bidders are advised to undertake site visit at their own cost in order to assess the exact nature and volume of work involved before submitting their bid.

4.2 **STANDARDS:** The Transformers shall confirm to the latest version of IS/IEC.

4.3 **LOCATION:** The UIHEP, Project Mukhiguda under OHPC Ltd. is situated at a distance of 90 Km from Bhawanipatna, Dist. Head Quarter, Kalahandi 135 Km from Kesinga (Nearest Railway Station).

4.4 **CLIMATIC AND SERVICE CONDITIONS:** The Climatic conditions at site under which the Equipment shall operate satisfactorily are as follows:

a) Maximum ambient Temperature – 44°C
b) Maximum daily average ambient Temperature - 45°C
c) Maximum yearly weighted ambient Air Temperature -32°C
d) Maximum relative humidity – 100 %
e) Maximum Annual Rain fall – 2649.7 mm
f) Minimum Annual Rain Fall – 1882 mm
g) No. of months during which Tropical Monsoon conditions prevails – 5and ½ Months.
h) Average Nos. of rain days in a year – 116 days
i) Maximum wind speed – 48 m/s
j) Altitude not Exceed = 400m

4.5 **PURCHASER'S AUXILIARY POWER SUPPLY:**

AC Supply: 400 Volt 3 Phase 50 Hz AC Supply
230 Volt Single Phase 50 Hz AC Supply
DC Supply: 220 Volt DC

4.6 **FOLLOWING IS THE LIST OF DOCUMENTS CONSTITUTING THIS SPECIFICATION:**

i. GENERAL TECHNICAL REQUIREMENTS.
ii. Detail Technical Specification.
iii. Guaranteed Technical Particulars (GTP) as per Annexure – 12 (To be submitted by the bidder duly filled).

4.7 GENERAL TECHNICAL REQUIREMENTS: –

4.7.1 STANDARDS:-

Reference to particular standard or recommendation in this Specification does not relieve the Supplier of the necessity of providing goods and services, complying with other relevant standards or recommendations.

The list of standards, provided in this Specification is not to be considered exhaustive and the supplier shall ensure that equipments, supplied under this contract meet the requirements of the relevant standard whether or not it is mentioned here.

IEC	IS	BS/other	Title
60076 P-1-2000 P-2-1993 P-3,5-2000 P-6-1997	2026	171	Power Transformers
–	–	6056	Methods of measurement of transformer and Reactor sound levels
–	–	4360	Weldable structural steel
–	–	61	Threads for light gauge copper tube and fittings
–	–	3600	Steel pipes and tubes for pressure purpose
–	–	4504	Flanges for pipes, valves and fittings
529	13947	EN60529	Enclosures for electrical apparatus (App. C–13947)
214	–	4571	On load tap changers
60137(1995)	2099	223	Bushings for alternating voltages above 1000V
–	3347	–	Dimensions for porcelain transformer bushing for use in lightly polluted atmospheres
223	–	4963	Tests on hollow insulators
60354(1991)	6600	BSCP-0160	Loading guide for transformers
606	–	–	Application guide for power transformers
60296 (Amd1-1986)	335	BS-14	Specification for unused mineral insulating oil for Transformers and reactors
34	325	–	Three phase Induction Motors
185	2705	–	Current Transformers
518	–	–	Dimensional standardization of terminals for HV Equipment
616	5578 (11353)	–	Terminal and tapping markings for Power Transformers
–	1886	–	Code of practice for installation and maintenance of Transformers
–	3639	–	Fittings and accessories for power transformers
–	3637	–	Gas operated relays
–	6272	–	Industrial cooling fans

–	4691	–	Degrees of protection provided by enclosures for rotating electrical machines
186	3156	–	Specification for voltage transformers
617	–	–	Graphical Symbols for drawings
–	2629	729	Galvanising
–	2633	–	Methods of testing uniformity for zinc coated articles
–	5	–	Colours for ready mixed paints and enamels
–	2147	–	Degrees of protection provided by enclosures for Low voltage switchgears and control gears
–	3401/1992	–	Silica gel
–	9434	–	Guide for sampling and analysis of dissolved gas in oil filled equipment.
–	12676	–	Oil impregnated paper insulated Bushing Dimension and requirements
60071, P-1-1993 P-2-1996	–	–	Insulation Co-ordination
–	375	–	Markings & Arrangements for switchgear Bus bars, Main connections and Auxiliary wiring
–	3638/1996	–	Application Guide for Gas operated Relays.
60214(1989)	8468		On-load Tap-changer
–	8269	–	Methods for switching Impulse Test on High Voltage Insulators
–	10028/1981 (Part-2)	–	Installation of Transformers.
–	10028/1981 (Part-3)	–	Maintenance of Transformers.
–	10561/1983	–	Application Guide of Power Transformers.
60542, Amd 1-1988	8468/1997	–	Application Guide for On-load Tap-changer
–	8263	–	Method for Radio Interference Tests on High Voltage Insulators.
–	3202	–	Code of practice for climate proofing of Electrical Equipment
–	6702/1972	–	Method for determination of Electric strength of Insulating Oils.
–	6103/1971	–	Method of Test for specific Resistance of Elect. Insulating Liquids.
–	6262/1971	–	Method of Test for power factor and Dielectric Constant of Electrical Insulating Liquids.
–	6104/1971	–	Method of Test for Interfacial Tension of oil against water by the Ring Method.

60034, P1-22(1972- 2000)	–	–	Rotating Electrical Machines.
60044, Amd P1-2000, P-6-1992	–	–	Instrument Transformers.
60060, P-1-1989, Amd P-2-1996	–	–	High Voltage Test Techniques.
60085 (1994)	–	–	Thermal Evaluation and classification of Elect. Insulation.
60270 (1981)	–	–	Partial Discharge Measurements.
60404-8-7 (1998)	–	–	Specification for Individual Materials-Cold Rolled Grain oriented Electrical Steel sheet and strip delivered in fully processed state
60529 (Amd 1-1999)	–	–	Degree of protection, provided by enclosures (IP-Code)
60551(Amd 1-1995)	–	–	Determination of Transformer and Reactor Sound Levels.
60567(1992)	–	–	Guide for sampling Gases and oil from oil-filled Electrical equipment for the analysis of free and Dissolved Gases
60599(1999)	–	–	Mineral Oil-Impregnated Electrical Equipment in service-Guide to the Interpretation of Dissolved and Free Gases Analysis
60722 (1982)	–	–	Guide to the Lightning and Switching Impulse Testing of Power Transformers and Reactors.
60815 (1986)	–	–	Guide for selection of Insulators in respect of polluted conditions.
60947, P-1-7 (I984-2000)	–	–	Low voltage switchgear & control gear
–	IEEE C 57.93	IEEE 1995	Guides for Installation of Liquid Immersed Power Transformers
–	–	IEEE Std 80	Guide for safety and AC Sub-station Grounding
–	–	IEEE Std 979	Guide for Sub-station Fire protection
–	–	IEEE Std 980	Guide for containment and control of oil spills in Sub-stations.
–	–	CBIP Pub.295/ 2006	Manual on Transformers
–	–	NFPA	National Fire Protection Association

- The standards, mentioned above are available from:
  Standard: Name and Address:

IS	Bureau of Indian Standards, Manak Bhawan, 9-Bahadur Sahah Zafar Marg, New Delhi - 110001, India.
IEC	International Electro Technical Commission, Bureau Central dela Commission, Electro Technique International, 1-Ruede Verembe, Geneva, SWITZERLAND.

- Transformer meeting with requirements of other authoritative International Standards that ensure equal or better performance than the standards, mentioned above shall also be considered. When the transformer, offered by the supplier conforms to other standards, salient points of difference between standards adopted and the standards, specified in this specification shall be clearly brought out in the offer. Two copies of such standards with authentic translation in English shall be furnished along-with the offer.

4.7.2 AUXILIARY POWER SUPPLY: -

Auxiliary electrical equipment shall be suitable for operation on the following supply system.

a)	Power devices like drive motors of Rating 1KW and above	415V, 3Phase, 4 Wire, 50 Hz, neutral Grounded AC supply.
b)	Lighting, space heaters and KW Motors.	240V, single phase, 50Hz, neutral Grounded AC supply.
c)	Alarm control and protective Devices	220V, DC, 2 Wire.

- Each of the foregoing supplies shall be made available by the purchaser at the terminal point for each transformer for operation of accessories and auxiliary equipment. Supplier's scope includes supply of interconnecting cables, terminal boxes etc. The above supply voltage may vary as below and all devices shall be suitable for continuous operation over entire range of voltages.

i)	AC Supply: -	Voltage ± 10% Frequency ± 5%
ii)	DC Supply: -	- 15% to + 10%

4.7.3 (i)<u>GENERAL TECHNICAL REQUIREMENTS</u>: -

4.7.3.1 <u>Duty Requirements</u>

1. The transformer will be used for bi-directional flow of rated power.
2. The transformer and all its accessories like C.Ts. shall be designed to withstand without injury, the thermal and mechanical effects of a short circuit at the terminals of any winding with full voltage, maintained on all other windings for duration of five seconds. The bidder is to furnish the supporting calculation towards above along with the bid offer. The short circuit level of the H.V. system to which the subject Transformer will be connected is 40KA(rms, 3-phase fault) for 220KV and 25KA for 33KV system.
3. The transformer shall be capable of being loaded in accordance with IS: 6600 upto loads of 150 %. There shall be no limitation imposed by bushings, tap changer etc.
4. The transformer shall be capable of being operated without danger on any tapping at the rated KVA with voltage variation of ± 10% corresponding to the voltage of that tapping.

5. Radio interference and Noise level:
   i. The transformers shall be designed with particular attention to suppression of maximum harmonic voltage, especially the third and fifth so as to minimize interference with communication circuits.
   ii. The noise level, when energized at normal voltage and frequency with fans running shall not exceed, when measured under standard conditions, the values, specified in NEMA, TR-1.
   The transformer noise levels shall be measured as a routine test and in accordance with IEC-60551:1981.
6. Transformer shall be capable of operating under the natural cooled condition upto the specified load. The forced cooling equipment shall come into operation by preset contacts of winding temperature indicator and the transformer shall operate as a forced cooled unit, as ONAF upto specified load. Cooling shall be so designed that during total failure of power supply to cooling fans, the transformer shall be able to operate at full load for at least ten (10) minutes without the calculated winding hot spot temperature exceeding 150 degree centigrade. Also stopping of one or two cooling fans should not have any effect on the cooling system. Transformers fitted with two coolers each capable of dissipating 50 percent of the loss at continuous maximum rating shall be capable of operating for 20 minutes in the event of failure of the blowers, associated with one cooler, without the calculated winding hot spot temperature exceeding 115 degree centigrade at continuous maximum rating.
7. Transformer shall be capable of withstanding thermal and mechanical stresses, caused by symmetrical or asymmetrical faults on any winding.
8. Transformer shall accept, without injurious heating, combined voltage and frequency fluctuation, which produces the following over fluxing condition:
   i. 125% for 1 minute — The base voltage and frequency refer
   140% for 5 seconds. — to those mentioned in Clause 4.0 (3& 4).
   ii. Over fluxing withstand characteristics upto 170% shall be submitted along with the bid.

4.7.3.2 <u>TRANSFORMER LOSSES</u>:-

1. The bidder shall indicate values of No load losses (iron losses), load losses (copper losses) and auxiliary losses in his bid, which shall be firm.
2. **<u>Loss figure for evaluation of bid</u>**:-
   For total cost evaluation for comparison, capitalized cost of losses shall be calculated at the following rates per one kilo watt of loss:
   i) No load losses- **Rs 2,66,016.00/KW**
   ii) Load (Copper) losses- **Rs1,59,610.00/KW**
   iii) Auxiliary losses- **Rs1,59,610.00/KW**
   For fraction of a KW, capitalized cost of losses should be calculated on pro-rata basis. The lowest figure of loss for the transformer, quoted by any Bidder shall be taken as basis and that quoted by the particular Bidder shall be used to arrive at the differential bid price to be applied for the bid. The transformer losses, guaranteed in the bid are to be supported by design calculations along with documentary evidences.

3. **Liquidated damage for excessive losses:-**

On testing, if it is found that actual losses are more than the values, quoted in the bid, undisputed liquidated damages shall be recovered from the supplier at the following rates:-

i) For each KW of excess in 'No Load losses…

Rs.5,32,032.00/KW

ii) For each KW of excess in 'Load losses' and "auxiliary losses" **Rs.3,19,220.00/KW**

For fractional of Kilowatt, penalties shall be applied on prorata basis. No bonus shall be payable for losses, which are less than those, stated in the Bid.

The purchaser reserves the right to reject the transformer, if on testing, the losses exceed the declared losses beyond tolerance limits as per I.S. or the temperature rise in oil and/or winding exceed the values, specified in technical particulars or impedance value differs from the guaranteed value including tolerance as per this specification and if any of the test results do not match with the values, given in the guaranteed technical particulars and as per technical specification. The purchaser reserves the right to retain the rejected transformer and take it into service until the supplier replaces it, at no extra cost to the purchaser by a new transformer. Alternatively, the supplier shall repair or replace the transformer in a reasonable period, as decided by the purchaser to purchaser's satisfaction at no extra cost to the purchaser.

4. **In case of failure of the transformer, the supplier shall take back the faulty transformer from its plinth for repair at their own cost (or replace the transformer with a new transformer) and deliver, at their own cost, unload at the destination sub-station transformer plinth within three months period from the date of intimation of defects to the satisfaction of the owner, at free of cost.** If the repair/replacement will not be completed within three months, then the supplier shall pay penalty @ 0.5% of the contract price for each calendar week of delay from the end of three months period from the date of intimation of defects. Also, the Purchaser reserves the right for forfeiture of the total Composite Bank Guarantee and all the Securities, available with OHPC, in case the Supplier fails to pay the penalty by one month before the expiry of the guarantee period. Also, this will be taken as adverse in all future tenders.

4.7.3.3 CLEARANCE :-

The overall dimensions of the transformer shall allow for sufficient clearances for installation in a 245/145 KV switchyard with bay width of 18000/10500 mm and boom height of 15/11 m.

4.7.3.4 CONSTRUCTIONAL DETAILS:

The features and constructional details of power transformer shall be in accordance with the requirements, stated hereunder:-

4.7.4.4.1 TANK AND TANK ACCESSORIES:-

1. **TANK**: -

a) The transformer shall be enclosed in a suitably stiffened welded steel tank such that the transformer can be lifted and transported without permanent deformation or oil leakage. The construction shall employ weldable, low carbon, tested quality structural steel of an approved grade to BS: 4360. The transformer tank shall have rectangular shape. The minimum thickness of base and tank cover shall be 12mm. and that of sides is 8mm.

b) The tank of the transformer shall be complete with all accessories and shall be designed so as to allow complete transformer in the tank and filled with oil, to be lifted by crane or jacks, transported by road or rail without over-straining any joint and without causing subsequent leakage of oil.
c) All seams and those joints, not required to be opened at site shall be factory-welded and wherever possible they shall be double welded. After completion of tank construction and before painting, dye penetration test shall be carried out on welded parts of jacking bosses, lifting lugs and all load bearing members. Also radiographic tests shall be carried out on 5% of total weld length. The requirement of post-weld heat treatment for tank/stress relieving parts shall be based on recommendations of BS: 5500, Table 4.4.3.1.
d) All necessary precautions shall be taken to prevent ingress of moisture between flange plates, around gaskets and O-rings, at insulator/flange interfaces etc. due to high humidity.
e) Tank stiffeners shall be provided, if required, for general rigidity and these shall be designed to prevent retention of water.
f) The transformer tank shall be of conventional type construction. In case the joint is welded, it shall be provided with flanges, suitable for repeated welding. The joint shall be provided with a suitable gasket to prevent weld splatter inside the tank. Proper tank shielding shall be done to prevent excessive temperature rise of the joint.
g) The main tank body excluding tap-changing compartments, radiators and coolers shall be capable of withstanding vacuums i.e. 100.64 KN/m² of gauge pressure, 760 mm of Hg.
h) The tank shall be designed to withstand:-
    i. Mechanical shocks during transportation.
    ii. Vacuum filling of oil.
    iii. Continuous internal pressure of 35 KN/m² over normal hydrostatic pressure of oil.
    iv. Short circuit forces.
i) Wherever possible, the transformer tank and its accessories shall be designed without pockets wherein gas may collect. Where pockets cannot be avoided, pipes shall be provided to vent the gas into the main expansion pipe. The vent pipes shall have minimum inside diameter of 15 mm except for short branch pipes, which may be 6 mm minimum inside diameter.
j) All joints other than those, which may have to be broken, shall be welded, when required, they shall be double-welded. All bolted joints to the tank shall be fitted with suitable oil-tight gaskets, which shall give a satisfactory service under the operating conditions and guaranteed temperature-rise conditions. Special attention shall be given to the methods of making hot oil tight joints between the tank and the cover as also between the cover and the bushing and all other outlets to ensure that the joints can be remade satisfactorily at site and with ease with the help of semi-skilled labour. If gasket is compressible, metallic stops shall be provided to prevent over compression.
k) Adequate space shall be provided at the bottom of the tank for collection of sediments.
l) The base of each tank shall be so designed that it shall be possible to move the complete unit by skidding in any direction without injury when using plates or rails.

m) Tank shields shall be such that no magnetic fields shall exist outside the tank. They shall be of magnetically permeable material. If required, impermeable shields shall be provided at the coil ends. Tank shield shall not resonate when excited at the natural frequency of the equipment. Bidder may confirm use of tank shields in the schedule of additional information.
n) Suitable guides shall be provided in the tank for positioning the core and coil assembly.
o) The tank shall be designed such that it can be mounted on the plinth directly.
p) When the transformers are provided with separately mounted radiators, flexible joints shall be provided in the main oil pipes, connecting the transformer tank to the radiator banks to reduce vibration and facilitate erection and dismantling.
q) The transformer tank, fittings, radiators and all accessories shall be designed to withstand seismic acceleration, as specified.
r) All connections, bolted to the tank shall be fitted with suitable gas oil resistant gaskets, made of such a material that no serious deterioration occurs under service conditions. Gaskets of nitrile rubber or equivalent shall be used to ensure perfect oil tightness. All gaskets shall be of closed design (without open ends) and shall be of one piece only. Rubber gaskets, used for flange connections of the various oil compartments shall be laid in grooves or in groove-equivalent retainers on both sides of the gaskets throughout their total length. Care shall be taken to secure uniformly distributed mechanical pressure over the gaskets and retainers throughout the total length. Gaskets of neoprene and/or any kind of impregnated/ bonded cork or cork only which can easily be damaged by over-pressing are not acceptable. Use of hemp as gasket material is also not acceptable.

2. **LIFTING AND HAULAGE FACILITIES :-**

The transformer tank shall be provided with: -

a) Lifting lugs, suitable for the weight of the transformer, including core and windings, fittings and with the tank, filled with oil.
b) At least four jacking lugs and where required, with lugs suitably positioned for transport on a beam transporter.
c) Haulage lugs to enable a steel rope to be used safely for haulage in any direction.
d) The transformer must be provided with clearly marked locations for the fixing of jacks. The free space between the bottom of the tank and the fixing for jacks must be 300 - 350 mm.

3. **FOUNDATIONS, CABLE DUCTING ETC.:-**

The Supplier will have to liaise with the Purchaser or its authorised contractor immediately after Design approval to finalize the detailed design of the following:-

- Transformer main tank foundations.
- Cooler bank foundations.
- Marshalling kiosk/control cabinet location and foundation.
- Cable ducting requirements.
- Adequate bunding design for the complete containment of all oil spills.
- Any other civil/electrical requirements for the installation of the transformer.

4. **TANK COVER**:

a) The tank cover shall be of adequate strength, shall not distort when lifted and shall be provided with suitable flanges having sufficient and properly spaced bolts. At least two adequately sized inspection openings, one at each end of the tank shall be provided for easy access to the internal connections of bushings, winding

connections and earthing links. The inspection covers shall not weigh more than 25 Kg. The inspection cover shall be provided with lifting handles.

b) The tank and cover shall be designed in such a manner so as to leave no external pockets in which water can lodge, no internal pockets in which oil can remain when draining the tank or in which air can be trapped when filling the tank, and to provide easy access to all external surfaces for painting. The design of the tank cover should not present a safety hazard to personnel working on top of the unit.
c) It must be possible to remove any bushing without removing the tank cover.
d) One pocket shall be provided for stem type thermometer in addition to those for the Bulbs of the oil temperature and winding temperature indicators. These pockets shall be located in the position of the maximum oil temperature and it must be possible to remove any bulb without lowering the oil level in the tank. Captive screwed caps shall be provided to prevent the ingress of water to the thermometer pockets when they are not in use.
e) Bushings, turrets, covers of inspection opening, thermometer pockets etc. shall be designed to prevent ingress of water into or leakage of oil from the tank.
f) All bolted connections shall be fitted with weather proof, hot oil resistant gasket in between for complete oil tightness. If gasket is compressible, metallic stops shall be provided to prevent over-compression.
g) The top part of the tank cover shall be sloped to prevent retention of rain water and shall not distort when lifted.
h) The tank cover and all covers for mounting, cleaning, man-holes, hand holes and inspection openings on tank etc. shall be earthed by suitable grounding conductors of the flexible type, having a cross-section of minimum 95 mm^2. Appropriate earthing studs with bolts and washers, made of stainless steel shall be provided.

5. **AXLES AND WHEELS**:
   a) The transformer shall be designed with flanged bi-directional wheels and axles of a suitable size to carry the full weight of the transformer, oil and accessories. These shall be so designed as not to deflect excessively to interfere with the movement of the transformer. Wheels, axles and bearings shall be fully corrosion - resistant and complete with fittings to facilitate lubrication.
   b) Suitable locking arrangement along with foundation bolts shall be provided for the wheels to prevent accidental movement of the transformer.
   c) The wheels are required to swivel and they shall be arranged so that they can be turned through an angle of 90 degrees when the tank is jacked up to clear of rails. Means shall be provided for locking the swivel movements in positions parallel to and at right angles to the longitudinal axis of the tank.
   d) The rail track gauge shall be 5'6" (1676 mm) along longer axis as well as along shorter axis.
   e) Foundation layout details will be furnished by the supplier during detailed Engineering.

6. **ANTI-EARTHQUAKE CLAMPING DEVICE :-**

   To prevent transformer movement during earthquake, clamping device shall be provided for fixing the transformer to the foundation. The Bidder shall supply necessary bolts for embedding in the concrete foundation. The arrangements shall be such that the transformer can be fixed to or unfastened from these bolts, as desired.

The fixing of the transformer to the foundation shall be designed to withstand seismic events to the extent that a static co-efficient of 0.3 g. applied in the direction of least resistance to that loading, will not cause the transformer or clamping devices as well as bolts to be over-stressed. Special steps must be taken to prevent mal-operation of Buchholz relay in such conditions.

The details of the device used and its adequacy, suitability and design calculations to withstand seismic load shall be brought out in the additional information schedule.

7. **CONSERVATOR VESSELS, OIL GAUGES AND BREATHERS:-**

a) A conservator, complete with sump and drain valve shall be provided in such a position, so as not to obstruct the electrical connections to the transformer having a capacity between highest and lowest visible levels of 7½% of the total cold oil volume in the Transformer and the cooling equipment from minimum ambient temperature to 100 Degree C. The minimum indicated oil level shall be with the feed pipe from the main tank covered with not less than 15 mm depth of oil and the indicated range of oil level shall be minimum to maximum.

b) If the sump is formed by extending the feeding pipe inside the conservator vessel, this extension shall be for at least 25 mm. The conservator shall be designed so that it can be completely drained by means of the drain valve provided, when mounted as in service.

c) The conservator tank shall be bolted on to its support of mounting to allow for its removal for cleaning/repair. It shall be bolted onto the main tank to allow for its removal for cleaning/repair.

d) The conservator for main tank shall be fitted with a magnetic oil level gauge with low oil level, electrically insulated alarm contacts. The indicator shall have the minimum and maximum levels, indicated along with the normal level at an oil temperature of 30° C. The temperature markings shall preferably be integral with the level-indicating device. The gauge should be readable from the transformer base level. Sight glasses of oil level indicators shall be of laminated security glass. Sight glasses of transparent plastics will not be accepted.

e) Taps or valves shall not be fitted to oil gauge.

f) The oil connection from the transformer tank to the conservator vessel shall be arranged at a rising angle of 3 to 9 degrees to the horizontal upto the Buchholz Relay and shall consist of 80 mm inside diameter pipes as per IS: 3639.

g) A valve shall be provided at the conservator to cut off the oil supply to the transformer, after providing a straight run of pipe for at least a length of five times the internal diameter of the pipe on the tank side of the gas and oil-actuated relay and at least three times the internal diameter of the pipe on the conservator side of the gas and oil-actuated relay.

h) The conservator tank shall be equipped with a nitrile rubber diaphragm or bag filled with dry air, which isolates the transformer oil space from the ambient air. The bag shall work satisfactorily and without damage at all anticipated oil temperatures.

i) Provision shall be made for monitoring the integrity of rubber bag and giving an electrical alarm when the bag is damaged.

j) The space inside the bag is to be connected to ambient air through a removable silica-gel type breather with oil trap and dust filter and mounted about 1400 mm above ground. No valve is to be placed between this breather and the conservator. The moisture absorption, indicated by change in colour of the tinted crystals inside

the breather can be easily observed from distance. Minimum quantity of silica gel will be 1 Kg. for every 3500 ltrs. of oil in the tank. The containers for the dehydrating agent shall be of transparent plastics. The quality of plastic material shall be got approved from the purchaser.

k) The conservator for the OLTC/diverter switch can be either an integral, but completely separated part of the main conservator or a separate oil tank. It shall have a prismatic or magnetic oil level gauge.

4.7.4.4.2 VALVES AND LOCATION: -

1) **General: -**

a) Blank flanges, plates or captive screw caps shall be fitted to all valves and pipe ends, not normally connected in service.

b) The omission of any, or the provision of alternative arrangements to the listed requirements, which alter the functional nature of the valve system, will not be accepted.

c) **All valves upto and including 100 mm shall be of gun metal. Larger valves may be of gun metal or may have cast iron bodies with gun metal fittings. They shall be of the full way type with internal screw and shall be opened by turning counter clockwise when facing the hand wheel.**

d) Means shall be provided for padlocking the valves in the open and closed positions. Provision is not required for locking individual radiator valves.

e) Every valve shall be provided with an indicator to show clearly the position of the valve.

f) All valves shall be provided with flanges having machined faces.

g) All valves shall be suitable for continuous operation with transformer oil at 100° C.

h) Suitable valves shall be provided to take sample of oil from OLTC chamber during Operation of the transformer.

i) Oil sampling valves shall have provision to fix rubber hose of 10 mm size to facilitate oil sampling.

j) Each transformer shall be fitted with the valves, identified in the following Sub-sections as a minimum requirement.

2) **<u>MAIN TANK</u>**:-

a) One 50 mm (NW 50) bore filter valve located near to the top of the tank.

b) One 50 mm (NW 50) bore filter valve located near to the bottom of the tank and diagonally opposite to the filter valve required against (a). Where design permits, this valve may be combined with item (c).

c) One 50 mm (NW 50) drain valve with such arrangements as may be necessary inside the tank to ensure that the tank can be completely drained of oil as far as practicable. This valve shall also be provided with an approved oil sampling device.

d) Two 25 mm (NW 25) oil valves for taking oil samples from the top and bottom of the tank. The top-oil sampling point shall be brought down to be accessible from ground level.

e) A flanged 50 mm (NW 50) valve suitably positioned near the top of the main tank for the connection by the Purchaser of a 'Hydran' monitor.

f) A 100 mm (NW 100) flange for the vacuum control switch tank will be provided on the tank cover.

3) **CONSERVATOR:-**
   a) One valve between the conservator and gas actuated relay for the main tank and, where appropriate, for the tap change diverter switch tank.
   b) One drain valve for oil conservator tank so arranged that the tank can be completely drained of all oil. It shall also be fitted with an oil-filling hole with cap.
4) **TAP CHANGER/DIVERTER SWITCH :-**
   50 mm filter and 50 mm (NW 50) drain valve where selector switches are contained in a separate tank.
5) **RADIATORS AND COOLER BANKS:-**
   Valves of adequate size as per 'CBIP Manual on Transformers (Publication No. 275)' at each point of connection to the tank shall be provided.
6) Air release plug(s) of adequate size shall be provided.

4.7.4.4.3 JOINTS AND GASKETS:-

a) All joint faces shall be arranged to prevent the ingress of water or leakage of oil with a minimum of gasket surface exposed to the action of oil or air.
b) Nitrile base cork or equivalent shall be used for gaskets. Oil resistant synthetic rubber gaskets are not permissible except where the synthetic rubber is used as a bonding medium for cork or similar material or where metal inserts are provided to limit compression.
c) Gaskets shall be consistent with the provision of a good seal and full details of all gaskets sealing arrangement shall be shown on the drawings.

4.7.4.4.4 PRESSURE RELIEF DEVICE:-

a) An approved pressure relief device of sufficient size shall be provided for rapid release of any pressure that may be generated within the tank and which might result in damage to the equipment. It shall positively operate, at a pressure of 7+/- 1PSi (48+/- 6.8KN/Sq.mm) and automatically reset when pressure falls below this value. There will be no leakage of oil after resetting of PRD. Means shall be provided to prevent the ingress of rain or dust. Pressure relief devices of the type mounted below normal oil level shall be of the resetting type once the dangerous pressure has been reduced to prevent unnecessary release of oil.
b) Contacts shall be provided for alarm and trip and initiation on operation of the device. Baffles shall be provided when necessary to safely control the direction in which oil or gas is ejected.
c) Unless otherwise approved, the pressure relief device(s) shall be mounted on the main tank and if on the cover, shall be fitted with a skirt projecting 25 mm. inside the tank to prevent gas accumulation.
d) One of the following methods shall be used for relieving or equalising the pressures in the pressure relief device.
   i. An equaliser pipe connecting the pressure relief device to the conservator or
   ii. The fitting of silica gel breather to the pressure relief device, the breather being mounted in suitable position for access at ground level.
e) Loss of oil on operation of the relief device shall be contained within the transformer oil retaining area.
f) The bidders shall furnish constructional, design details of pressure relief device(s) and calculations along with the bids to prove that the size and setting of pressure relief device(s) is adequate, considering the rating of the transformer, the quantity

of oil in the Transformer and the insulating oil will not catch fire in case of any short/ground fault inside the transformer.

4.7.4.4.5 EARTHING TERMINALS:

Two substantial steel flag type terminals (each having two tapped holes with M10 bolts, plain and spring washers), capable of carrying for 5 seconds the full lower voltage short circuit current of the transformer and suitable for connection to 50 x 8 mm. Galvanised steel flat shall be located one on either side and near to the bottom of the transformer to facilitate connection to the local earthing system. The supplier shall provide earthing strips up to the ground level. Also each radiator, marshalling Kiosk, OLTC etc. shall be suitably earthed to the transformer tank or else have earthing terminals as appropriate.

4.7.4.4.6 CORROSION PROTECTION:

1) General:
   a) Bidders shall state clearly the corrosion protection, applied to aluminium and aluminium-alloy parts.
   b) Bidders shall draw attention to all exposed points in their equipment at which aluminium or aluminium- alloy parts are in contact with or in close proximity to other metals and shall state clearly the protection employed at each point to exclude air and moisture.
   c) A full description of the corrosion prevention system, proposed by the Bidder shall be given and this is subject to acceptance by the purchaser. This description shall include details of surface preparation, rust inhibition, and paint thickness, treatment of fasteners and painting of surfaces in contact with oil.
2) The minimum standards acceptable to the purchaser are:-
   a) Hot Rolled Steel:
      i. Grit blasting to grade sa 2.5 of ISO 8501-1.
      ii. Epoxy-base zinc primer. Coating thickness 25 micrometer.
      iii. Zinc spraying of tank bottom. Thickness 100 micrometer.
      iv. Epoxy-based micaceous iron-oxide paint. Coating thickness 40 micrometer.
      v. Alkyd or phenolic-based micaceous iron-oxide paint. Coating thickness-40 micrometer.
   b) Radiators and Fasteners larger than 12 mm:-
      i. Hot dip galvanized to IS: 2633.
      ii. Cleaning and surface preparation followed by paint treatment as specified above.
   c) Smaller fasteners, cable clips:-
      Use of non-ferrous material, stainless steel or appropriate plated components.

4.7.4.4.7 RATING, DIAGRAM AND VALVE PLATES:-

The following plates or an approved combined plate shall be fixed to each transformer Tank at an average height of 1500 mm above the ground level:-

a) A rating plate bearing the data, specified in IEC 76 Part - I. This place shall also include: -
   i. The short circuit current rating.
   ii. Time factor for each winding measured.
   iii. Measured no load current and noload losses at rated voltage and rated frequency.
   iv. Measured load losses at 75° C (Normal tap only).
   v. D.C. resistance of each winding at 75° C.

b) A diagram plate showing in an approved manner, the internal connections and the voltage vector relationship of the several windings, in accordance with IEC 76 Part-I with the transformer voltage ratio for each tap and, in addition, a plan view of the transformer giving the correct physical relationship of the terminals.
c) A plate showing the location and function of all valves and air-release cocks or plugs. This plate shall also if necessary warn operators to refer to the Maintenance Instructions before applying vacuum.
d) Current transformers Rating Plate.
e) Diagram plate, indicating the oil levels in the conservators dependent on the oil temperature.
f) Loading plan plate, showing transport dimensions and masses. This plate shall also warn the erection staff not to remove any cover, before filling the tank with oil to such a level where the windings are not exposed to the atmosphere. This shall be fixed directly on to the transformer tank and shall not be removed for transport.
g) Identification plates, alpha-numerical number in an approved manner, for all fans, marshalling cabinets, breathers, valves, cocks, accessories etc. (minimum size: 110mm x 50mm) rigidly fastened by rivets on corrosion proof base plates. In addition, the function (description) of the related devices shall be clearly indicated on these plates. The alphanumerical numbers on the identification plates shall be of such a size as to be clearly legible from the floor level.
h) Plates, showing all control, measuring and monitoring circuits and terminal blocks. These plates shall be rigidly fixed at the inner side of the hinged door of the concerned marshalling kiosk.
i) Plates, showing the control circuit/ block diagram of the OLTC. These plates shall be rigidly fixed at the inner side of the hinged door of the motor drive cubicle.
Out door arranged plates are to be of polished stainless steel of top quality only (back ground clear, engraving black, depth of engraving 0.5mm) stainless steel, capable of withstanding the rigours of continuous outdoor service at site. Plates, arranged inside control and marshalling cubicles may be of material in accordance with manufacturer's standard, e.g. glass -fibre reinforced synthetic resin (subject for approval). All plates other than those located on tank cover shall be easily and clearly legible from ground level.

4.7.4.4.8 <u>CORE: -</u>

a) The core shall be constructed from high grade non-ageing cold rolled supper grain-oriented silicon steel laminations, known as HIB steel as trade name having high permeability and low hysteresis loss. B-H and specific loss curve shall be furnished in support of these materials. Laminations of one particular thickness i.e.0.23mm. or 0.27mm. or better (quoted grade and type) shall be used. Laminations of different grade(s) and different thickness(s) are not allowed to be used in any manner or under any circumstance.
b) After being sheared, the lamination shall be treated to remove all burrs and shall be reannealed to remove all residual stress. The insulation of the lamination, which is to be stated in the tender, shall be inert to the action of the hot transformer oil and pressure.
c) The design of the magnetic circuit shall be such as to achieve minimum possible active and reactive core losses during the entire life of the transformer.

d) The design of the magnetic circuit shall be such as to avoid static discharges, development of short circuit paths within itself or to the earthed clamping structure and production of flux component at right angles to the plane of laminations, which may cause local heating. The joints of limbs and yokes shall be designed and constructed to keep the no-load losses and the hot spot temperature in the magnetic core as well as the noise level as low as possible.

e) The core and winding shall be capable of withstanding the shock during transport, installation, service and adequate provision shall be made to prevent movement of core and winding relative to tank during these conditions and reduce vibrations to a minimum for all operating conditions. Care shall also be taken to secure uniformly distributed mechanical pressure over all the laminations to prevent setting of the core and to limit noise and vibration to a minimum under service conditions.

f) The Transformer shall be of **BOLTLESS** core design. The Bidders shall furnish the following documentary evidence towards their experience and performance in such type of design.
   i. Purchase order
   ii. Approved drawings & GTP
   iii. Any other documents related to boltless core design.

g) All steel sections, used for supporting the core shall be thoroughly sandblasted after cutting, drilling and welding. Any non-magnetic or high resistance alloy shall be of established quality.

h) When bell type construction is offered, suitable projecting guides shall be provided on core assembly to facilitate removal of tank. The supporting framework of core shall be so designed so as to avoid presence of pockets, which would prevent complete emptying of the tank through drain valve or cause trapping of air during oil filling.

i) The core shall be provided with lugs suitable for lifting the complete core and coil assembly of the transformer.

j) The core and coil shall be so fixed in the tank that shifting will not occur when the Transformer is moved or during a short circuit.

k) Oil ducts shall be provided where necessary to ensure adequate cooling. The winding structure and major insulation shall not obstruct the free flow of oil through such ducts. Where the magnetic circuit is divided into pockets by cooling ducts parallel to the planes of laminations or by insulating material above 0.25 mm thick, tinned copper strip bridging pieces shall be inserted to maintain electrical continuity between pockets.

l) The temperature gradient between the core and surrounding oil shall be maintained less than 20°C. The manufacturer shall demonstrate this either through a test (procedure to be mutually agreed) OR by a calculation.

m) The transformer shall be designed in such a way that the maximum flux density in any part of the core and yoke at rated M.V.A, minimum frequency and highest system voltage shall not exceed 1.6 Tesla. The Tenderer shall establish this by calculation as per given format.

n) **Minimum knee point voltage is 110% of rated voltage. Accordingly, the operating flux density for design should be carefully chosen within the stipulated value to achieve the above minimum knee point voltage. The tenderer shall quote the practical achievable no load current at different percentages of rated voltage as**

per Guaranteed Technical Particulars along with a linear graph confirming the above said knee point voltage which will be verified during no load test method that 10% increase in voltage from 110% rated voltage causes the excitation current to increase not by more than 50%.

o) Core material shall be directly procured either from the manufacturer or through their accredited marketing organizations of repute and not through any agent. **All the core import documents must be in the name of the transformer manufacturer.**

p) The bidder should preferably have in-house core-cutting facility for proper monitoring and control on quality and also to avoid any possibility of mixing of prime material with defective/ second grade material.

4.7.4.4.8.1 EARTHING OF CORE CLAMPING STRUCTURE :

The top main core clamping structure shall be connected to the tank body by a copper strip. The bottom clamping structure shall be earthed by one or more of the following methods: -

a) By connection through vertical tie-rods to the top structure.

b) By direct-metal-to metal contact with the tank base maintained by the weight of the core and windings.

c) By a connection to the top structure on the same side of the core as the main earth connection to the tank.

4.7.4.4.8.2 EARTHING OF MAGNETIC CIRCUITS :

a) The magnetic circuit shall be earthed to clamping structure at one point only through a removable link, placed in an accessible position just beneath an inspection opening in the tank cover and which, by disconnection, will enable the insulation between the core and clamping plates etc. to be tested at voltages upto 2.0 KV (rms). The removable link shall have adequate section to carry ground fault current.

b) When magnetic circuits are subdivided into separate isolated sections by ducts perpendiculars to the plane laminations, all such sections shall be earthed.

4.7.4.4.8.3 SIZE OF EARTHING CONNECTIONS:-

To be proposed by the manufacturer for the Purchaser's approval.

4.7.4.4.9 WINDINGS:-

a) The supplier shall ensure that the windings of all EHV class transformers are made in dust proof conditioned atmosphere.

b) The windings for system rated voltages of 220 KV shall have graded insulation, as defined in IEC-76 and IS-2026. The winding for 33 KV shall be fully insulated.

c) All neutral points shall be insulated to withstand the applied test voltage as per above standards.

d) The neutral ends of star connected three phase windings shall be connected at points, which are accessible from manholes in the cover and brought out via one bushing.

e) The conductors for the windings and connecting leads shall be of electrolytic grade copper, free from scales and burrs and shall have properly rounded corners to reduce electrostatic flux concentration.

f) The current density, adopted for all the windings shall not exceed 2.8 Ampere/sq.mm. The total net cross-sectional area of the strip conductors for calculating the current density for each winding shall be obtained after deducting the copper area, lost due to rounding up of the sharp edges of the rectangular conductors.

g) The copper conductors, used in the coil structure shall be best suitable to the requirements and all permanent current carrying joints of the windings and the leads shall be welded or braced or crimped.
h) The coils shall be supported between adjacent sections by insulating spacers and the barriers, bracings and other insulation, which shall be arranged to ensure a free circulation of the oil and to reduce hot spots in the windings. The stacks of windings shall receive adequate shrinkage treatment before final assembly. Adjustable devices shall be provided for taking up any possible shrinkage of coils in services.
i) The transformer shall be designed to withstand impulse and power frequency test voltages as specified in IEC 76 and IS: 2026.
j) The windings shall be capable of withstanding axial and radial forces during fault conditions as per this tender specification.
k) The short circuit temperature rise should not exceed the limits, fixed as per IS:2026.
l) The insulation of transformer windings and connections shall be free from insulating compounds which are liable to soften, ooze out, shrink or collapse or be catalytic and chemically active in the hot transformer oil during service. The dielectric strength of winding insulation shall conform to the values, given in IS: 2026, as amended up to date.
m) The coil clamping arrangement and the finished dimensions of any oil duct shall be such as will not impede the free circulation of oil through the ducts.
n) No strip conductor wound on edge shall have a width exceeding six times its thickness.
o) The conductors shall be transposed at sufficient intervals in order to minimize eddy currents and equalize the distribution of currents and temperatures along the windings.
p) The windings and leads of all transformers shall be able to withstand the shocks, which may occur through rough handling and vibration during transport, switching and other transient service conditions including external short circuit. Adequate barriers shall be provided between windings and core and between windings. All leads or bars from the windings to the terminal boxes and bushings shall be rigidly supported. Stresses on coils and connections must be avoided.
q) The windings shall be located in a manner, which will ensure that they remain electro-magnetically balanced and their magnetic centres remain co-incident under all conditions of operations.
r) Tappings shall be so arranged as to preserve the magnetic balance of the transformer at all voltage ratios.
s) The coils should be made up, shaped and braced to provide for expansion and contraction due to temperature changes.
t) Coil clamping rings, if provided, shall be of steel or of suitable insulating material.
u) All threaded connections shall be provided with locking facilities. All leads from the winding to the terminal board and bushing shall be rigidly supported to prevent injury from vibration. Guide tubes shall be used, where practicable.
v) The assembled core and windings shall be vacuum dried and suitably impregnated before removal from the treating tank.
w) Where coil-clamping rings are of metal at earth potential, each ring shall be connected to the adjacent core clamping structure on the same side of the transformer as the main earth connection. However, same shall be proposed by the manufacturer for the Purchaser's approval.

x) Washers in contact with non-ferrous parts, which carry current, shall be of phosphorous bronze.

y) The tenderer should have in house availability of vapour phase Drying (VPD) plant for proper drying of the insulation. In case VPD facility is not available, the bidder will prove that the method of drying adopted by them is equivalent or better than VPD in terms of level of dryness and other benefits of VPD.

z) The air-core reactance of HV winding of Transformer shall not be less than 20%.

aa) The transformer shall be designed to withstand a DC current of 10A per phase without injurious heating.

bb) Tan delta value for windings shall be less than 0.005. Tan delta shall be measured at ambient temperature. No temperature correction factor shall be applied.

cc) The arrangement of the core and windings shall be in the following manner:-
CORE-LV-HV-REGULATING

4.7.4.4.10 GAS AND OIL-ACTUATED RELAYS:-

a) The transformer shall be fitted with gas and oil-actuated relay equipment having alarm contacts, which close on collection of gas or low oil level, and tripping contacts which close following oil surge conditions. Separate relays shall be provided for on load tap changer.

b) Each gas and oil-actuated relay shall be provided with a test cock to take a flexible pipe connection for checking the operation of the relay.

c) Each relay shall be fitted with a calibrated glass window for indication of gas volume.

d) To allow gas to be collected at ground level, a small bore pipe shall be connected to the gas release cock of the gas and oil-actuated relay and brought down to a point, approximately 1400 mm above ground level, where it shall be terminated by a cock, which shall have provision for locking to prevent unauthorized operation.

e) The design of the relay mounting arrangements, the associated pipe work and the cooling plant shall be such that mal-operation of the relay will not take place under normal service conditions, including starting or stopping of oil circulating pumps whether by manual or automatic control under all operating temperatures.

f) The pipe work shall be so arranged that all gas arising from the transformer will pass into the gas and oil-actuated relay. The oil circuit through the relay must not form a delivery path in parallel with any circulating oil pipe, nor is to be tied into or connected through the pressure relief vent. Sharp bends in the pipe work shall be avoided. For this reason, bushing turrets, if fitted shall have vent pipes, which will route any gas collection through the relay.

g) A machined surface shall be provided on the top of each relay to facilitate the setting of the relays and to check the mounting angle in the expansion pipe and the cross level of the relay.

h) A straight run of pipe work shall be provided for a length of five times the internal diameter of the pipe on the conservator side of the gas and oil-actuated relay.

i) The surge float contacts shall close at a rate of steady oil flow between the following limits. As far as possible, the limits shall also be met when the relay is subjected to oil surge conditions, produced by rapid opening of a lever operated gate valve.

j) The relays shall be so located as to be easily accessible from the top of the tank. Oil Pipe Connection I.D. (mm) Operational Limits for Relay.

[Rising angles of 1° to 9°.]

25	**700 – 1300**
50	**750 – 1400**
70	**900 – 1600**

k) The gas collection contacts shall operate within the angle limits, specified for test:

l) When a transformer is provided with two conservators, the gas and oil - actuated relays shall be arranged as follows:

i. If the two conservators are connected to the transformer by a common oil pipe, one relay shall be installed in the common pipe.

ii. If the two conservators are piped separately to the transformer, two relays shall be installed, one in each pipe connection.

m) The clearance between oil pipe work and live metal shall be not less than the minimum clearances as per standard practice.

4.7.4.4.11 TEMPERATURE INDICATING DEVICES AND ALARMS:-

The Transformer shall be provided with approved devices for indicating the oil temperature and hot spot winding temperature of each winding. The devices shall have a dial type indicator and in addition, a pointer to register the highest temperature reached and re-setting device. Each temperature device shall have three separate contacts fitted, one of which shall be used to control the cooling plant motors, one to give an alarm and one to trip the associated circuit breakers.

a) Oil Temperature Indicator (OTI)

The thermometer for top oil temperature indication should be of 150mm. dial type. A temperature-sensing element, suitably located in a pocket on top oil shall be furnished. This shall be connected to the OTI by means of capillary tubing. Accuracy class of OTI shall be ± 1.5% or better. The temperature indicator dials shall have linear graduations to clearly read at least every 2 deg. C.

b) Winding Temperature Indicator (WTI).

A device for measuring the hot spot temperature of each of the HV/LV windings shall be provided. It shall comprise of the following:-

i) Temperature sensing element

ii) Image Coil

iii) Auxiliary CTs, if required to match the image coil, shall be provided and mounted in the cooler control cabinet. The current transformers shall be of class 1, and the rated primary current shall correspond to the rated current of the related transformer winding. The effective resulting rated secondary current shall be 2A. Matching units between current transformers and thermal replicas shall not be provided.

iv) 150 mm diameter local indicating instrument with maximum reading pointer, mounted in cooler control cabinet and with two adjustable electrically independent ungrounded contacts (besides that required for control of cooling equipment), one for high winding temperature alarm and one for trip. The temperature indicator dials shall have linear graduations to clearly read at least 2 deg. C

v) Calibration device

vi) In addition to the above, the following indication equipment shall be provided for each winding for remote indication.

1. Conventional Remote winding temperature indicator & Remote Oil temperature indicator: - It shall be suitable for flush mounting on RTCC panel. The difference between local and remote indication at any given time shall not exceed 1 deg. C.

2. Auxiliary supply, if required, in RTCC panel, for above, shall be 220V DC only.
3. The drawing showing details of above shall be submitted to the purchaser.
4. Accuracy class of WTI & OTI shall be +/- 1.5% or better.
5. Any special cable(s), required for shielding purpose for connection between cooler control cabinet and remote winding temperature indicator control circuit shall be in Bidder's scope.

c) The winding temperature indicators shall be housed in the cooler control cabinet/marshalling kiosk. The tripping contacts of the winding temperature indicators shall be adjustable to close between 80°C and 150°C and to re-open when the temperature has fallen by not more than 10°C.

d) The alarm contacts and the contacts used to control the cooling plant motors on the above devices shall be adjustable to close between 50°C and 100°C and to re-open when the temperature has fallen by a desired amount between 10° C and 15° C.

e) All contacts shall be adjustable to a scale and must be accessible on removal of the relay cover. Alarm and trip circuit contacts shall be suitable for making or breaking 150 VA between the limits of 30 and 250 Volts AC or DC and of making 500 VA between the limits of 110 and 250 V DC. Cooler motor control contacts shall be suitable for operating the cooler contactors direct, or if necessary, through an interposing relay.

f) The temperature indicators in the marshalling kiosk shall be so designed that it is possible to move the pointers by hand for the purpose of checking the operation of the contacts and associated equipment.

g) The working parts of the instrument shall be made visible by the provision of cut-away dials and glass-fronted covers. All setting and error adjustment devices shall be easily accessible.

h) Connections shall be brought from the device to terminal boards, placed inside the marshalling cubicle.

i) Terminals, links and a 63 mm moving iron ammeter shall be provided in the marshalling kiosk for each WTI for: -

i) Checking the output of the current transformer.

ii) Testing the current transformer and thermal image characteristics.

iii) Disconnecting the bulb heaters from the current transformer secondary circuit to enable the instrument to be used as an oil temperature indicator.

j) Sight glasses of temperature indicators shall be of laminated security glass. Sight glasses of transparent plastics will not be accepted.

4.7.4.4.12 <u>COOLLING EQUIPMENT AND ITS CONTROLS</u>:

1) <u>Cooling Equipment:</u>
   a) The Cooler shall be designed using 2 x 50 % radiator banks.
   b) Each radiator bank shall have its own cooling fans, shut off valves, lifting lugs, top and bottom oil filling valves, air release plug, a drain valve and thermometer pocket, fitted with captive screw cap on the inlet and outlet oil pipes.
   c) One stand by fan of at least 20% capacity shall also be provided and identified with each radiator bank.
   d) Cooling fans shall not be directly mounted on radiator bank which may cause undue vibration.
   e) The exhaust airflow from cooling fan shall not be directed towards the main tank in any case.

f) Cooling fans for each radiator bank shall be located so as to prevent ingress of rainwater.
g) It shall be possible to remove the blower complete with motor without disturbing or dismantling the cooler structure framework.
h) The blades of cooling fans shall be of galvanised steel or cast aluminum alloy unless otherwise approved. Thickness of galvanization shall be minimum 55 microns.
i) Blower casings shall be made of galvanised steel of thickness not less than 2 mm or aluminum alloy and shall be suitably stiffened by angles or tees.
j) Galvanised wire guards with mesh not exceeding 12.5 mm shall be provided to prevent accidental contact with the blades. Guards shall also be provided over all moving parts. Guards shall be designed such that blades and other moving parts can not be touched by test fingers to IEC - 529:1976 (BSEN60529). Direction of rotation shall be indicated.
k) Cooling fan motors shall be suitable for operation from 415 volts, three phase and 50 Hz power supply and shall conform to IS: 325. The motor winding insulation shall be conventional class 'B' type. Motors shall have hose proof enclosure - equivalent to IP: 55 as per IS: 4691.
l) Each cooling fan motor shall be provided with starter thermal overload and short circuit protection.
m) **Each radiator shall be provided with the following items: -**
   - One shut off valve at the top.
   - One shut-off valve at the bottom.
   - Air release device at the top.
   - Lifting lugs to lift entire cooling assembly.
   - Air release device and oil plug on oil pipe connections.
   - Loose blanking plates for blanking off the main oil connections.
   - Visual oil flow indicators, fitted with the electrical contacts to close when oil is not flowing. Contacts are to be connected in the cooler fail alarm circuit.

   Each radiator bank shall be provided with the following items: -
   - Main and sampling device at the bottom.
   - Expansion joints, one each on top and bottom cooler pipe connections.
   - A thermometer pocket fitted with captive screw cap, in the inlet and in the out let oil pipes.
n) **Coolers shall be so designed as to be accessible for cleaning and painting to prevent accumulation of water on the outer surfaces to completely drain oil in the tank and to ensure against formation of gas pockets when the tank is being filled.**
o) **<u>OIL PIPES AND FLANGES</u>** :
   - All oil piping, necessary for connecting of each transformer to its conservator, cooler banks etc. shall be supplied under this contract.
   - The oil piping shall be of approved material with machined flanged joints.
   - Copper pipe work is to comply with BS.61.
   - Dimensions of steel pipes shall be in accordance with BS. 3600: 1973 and the drilling of all pipe flanges shall comply with BS: 4504:1969.
   - An approved expansion piece shall be provided in each oil pipe connection between the transformer and each oil cooler bank.

- All necessary pipe supports, foundation bolts and all other attachments are to be provided.
- It shall be possible to drain any section of pipe work independently of the rest and drain valves or plugs shall be provided as necessary to meet this requirement

N. B.: - The omission of any or the provision of alternative arrangements to the above requirements will not be accepted.

2) **COOLING EQUIPMENT CONTROL (ONAN/ONAF COOLING):-**

a) Automatic operation control (switching in and out) of fans shall be provided (with temperature change) from contacts of winding temperature indicator. The supplier shall recommend the setting of WTI for automatic change over of cooler control from ONAN to ONAF. The setting shall be such that hunting i.e., frequent start operations for small temperature differential do not occur.

b) Suitable manual control facility for cooler fans with manual/automatic select or switches and push buttons shall be provided.

3) **INDICATING DEVICES**:-

Following lamp indications shall be provided in cooler control cabinet.

- Fan 'ON' Fan 'OFF'
- Cooling system 'On Automatic Control'.
- Cooling system 'On Manual'.
- Selector switch in 'auto' or 'manual' for each fan.
- 415 volts cooler supply auto changeover.
- Cooler supply failure for each supply.
- Cooling fan failure for each fan.
- Control supply failure for main and stand by.
- One potential free initiating contact for all the above indications shall be wired independently to the terminal blocks of cooler control cabinet exclusively for purchaser's use.
- A 12-window annunciator shall be provided in the RTCC panel for visual and audible signalling of important functions of cooling equipment and tap changer.

4) **COOLER CONTROL CABINET:**

a) Each transformer unit shall be provided with a cooler control cabinet.

b) The cooler control cabinet shall have all necessary devices, meant for cooler control and local temperature indicators. All the contacts of various protective devices, mounted on the transformer shall also be wired upto the terminal board in the cooler control cabinet. All the secondary terminals of the bushing CTs shall also be wired up to the terminal board at the cooler control cabinet.

c) The cooler control cabinet shall have two (2) sections. One section shall have the control equipment, exclusively meant for cooler control. The other section shall house the temperature indicators, auxiliary CTs. and the terminal boards, meant for termination of various alarm and trip contacts as well as various bushing CT Secondaries. Alternatively, the two sections may be provided as two separate panels, depending on the standard practices of the supplier.

d) The temperature indicators shall be so mounted that the dials are not more than 1600 mm from ground level. Glazed door of suitable size shall be provided for convenience of reading.

5) **TERMINAL BLOCK**:

a) The terminal blocks ('ELMEX' Make, Type – OAT 6 or its equivalent), to be provided shall be fully enclosed with removable covers and made of moulded, non-inflammable plastic material with block and barriers, moulded integrally. Such block shall have washer and binding screws for external circuit wire connections, a white marking strip for circuit identification and moulded plastic cover. All terminals shall be clearly marked with identification numbers or letters to facilitate connection to external wiring.

b) All internal wiring to be connected to the external equipment shall terminate on terminal blocks, preferably vertically mounted on the side of each panel. The terminal blocks shall be 1100 V grade and have 10 Amps continuous rating moulded piece, complete with insulated barriers, non-disconnecting stud type terminals, washers, nuts and lock nuts. Terminal block design shall include a white fibre-marking strip with clear plastic, slipon/clipon terminal cover. Markings on the terminal strips shall correspond to wire number and terminal numbers on the wiring diagrams.

c) Terminal blocks for current transformer's secondary leads shall be provided with test links and isolating facilities. Also current transformer secondary leads shall be provided with short-circuiting and earthing facilities.

d) At least 20% spare terminals shall be provided on each panel and these spare terminals shall be uniformly distributed on all terminal blocks.

e) Unless otherwise specified, terminal blocks shall be suitable for connecting the following conductors on each side.

i) For all circuits except current transformer circuits, minimum of two nos. 2.5 sq.mm copper.

ii) For all CT circuits, minimum of two nos. 4 sq. mm. copper.

f) There shall be a minimum edge-to-edge clearance of 250 mm. between the first row of terminal block and the associated cable gland plate. Also the clearance between two rows of terminal blocks shall be minimum of 150 mm.

g) Arrangement of the terminal block assemblies and the wiring channel within the enclosure shall be such that a row of terminal blocks is run parallel and in close proximity long each side of the wiring duct to be provided for convenient attachment of internal panel wiring. The side of the terminal block, opposite the wiring duct shall be reserved for the owner's external cable connection. All adjacent terminal blocks shall also share this field-wiring corridor. A steel strip shall be connected between adjacent terminal block rows at 450 mm intervals for support of incoming cables.

h) The number and sizes of the purchaser's multi-core incoming cable will be furnished to the Bidder after placement of the order.

6) **LABELS.**

a) Labels shall be provided for all the apparatus such as relays, switches, fuses etc., contained in control cabinets/marshalling box.

b) Description labels for mounting indoor or inside control cabinets/marshalling box shall be of such material that will ensure permanence of lettering. A matt of satin finish shall be provided to avoid dazzle from reflected light. Labels, mounted on dark surfaces shall have white lettering on a black background. All plates shall be of a material, which will not get corroded.

c) Labeling shall be clear, concise and adequate.

d) Labels shall be supplied as far as possible in the following four standard sizes
   i. Label for fuses and links shall measure approximately 28mm. to 45mm by 13mm. to 19mm. and lettering of 3mm to 6mm. shall be used according to the amount of inscription required. The lettering shall have strokes of approximately 1mm. width.
   ii. Labels for relays, contactors, thermal devices and similar apparatus shall measure 65mm. by 20mm. and shall have lettering as specified in (i) above.
   iii. Labels for controllers and changeover switches shall measure 70mm. by 30 mm and where practicable have 20 mm lettering with 1.5 mm strokes.
   iv. The labels for the doors of junction boxes, marshalling boxes and similar equipment shall measure 125 mm x 50 mm and have 13 mm, lettering with 1.5 mm wide strokes.
e) The labels for mounting outdoor shall be weather and corrosion proof. The letters/diagrams thereon shall be framed by etching or other such process, which will ensure permanence of the lettering/marking.
f) Labels shall be attached to panels with brass screws or with steel screws which have received rust preventive treatment.

4.7.4.4.13 VOLTAGE SELECTION AND CONTROL :

1) On load tap changers:

1. General:

a) The OLTC shall be of In Tank, Hi Speed Resistor type.

b) OLTC gear shall be motor-operated for local as well as remote electrical operation. An external hand wheel/handle shall be provided for local manual operation.

c) On-load tap-changer shall be sourced from reputed manufacturer and it should be type tested as per relevant IEC-60214 and test methods shall be in full conformance to the procedures, indicated in IEC-60214.

d) The details of the method of diversion of the load current during tap-changing, the mechanical construction of the gear and control features of OLTC gear shall be submitted with the bid. Information regarding the service experience on the gear and a list of important users shall be furnished. The tap-changer shall change the effective transformation ratio without producing phase displacement.

e) The current diverting contacts shall be housed in a separate oil chamber, not communicating with the oil in the main tank of the transformer. On load tap changer shall have maximum rated through current to meet the normal rated load as well as over-load as per standards. The OLTC should also be suitable for an occasional switching at 200% of the OLTC rating as per IEC-60214 which shall be validated with by the type test. The OLTC shall have BIL rating and short circuit withstand current as per relevant IEC standards.

f) All terminals shall be clearly and permanently marked with numbers corresponding to the cables connected thereto.

g) Tap positions shall be numbered consecutively ranging from one upwards. **Tap one being the highest voltage ratio.**

h) Current rating and voltage steps shall be as specified.

i) On-load tap changers shall comply with IEC 214:1976 and BS: 4571:1970 and shall be suitable for power flow in both the directions. **Only designs, which have been type tested in accordance with these standards will be accepted. All the type test**

certificates as per the above standards shall be submitted along with the tender bid.

j) Current making and breaking switches, associated with the tap selectors shall be contained in a tank in which the head of oil is maintained by means, completely independent of that on the transformer itself.

k) Details of maintaining oil separation, oil levels, oil draining/filling/sampling, detection of oil surges and provision of alarm and trip contacts will be dependent on the design of tap-changer and be to the approval of the purchaser. However, a suitable pressure relief device shall be provided for all on-load tap changer compartments. It should be possible to inspect the diverter switch contacts without having to lower the oil in the transformer. Contact tips should be replaceable.

l) Transformer on load tap changers shall be equipped with a fixed resistor network, capable of providing discrete voltage steps for input to the supervisory system.

m) The Bidder shall indicate the safeguards in order to avoid harmful arcing at the current diverting contacts in the event of operation of the OLTC gear under overload conditions of the transformer.

n) Any 'DROP DOWN' tanks, associated with the tap changing apparatus shall be fitted with guide rods to control the movements during lifting or lowering.

o) All relays and operating devices shall operate correctly at any voltage between the limits specified.

p) The OLTC shall be suitably protected through oil surge relay. This surge relay shall be tested for an oil flow velocity of 1.20 +/- 0.20 m/s.

2. MECHANISMS:

a) The drive mechanism chamber shall be mounted on the tank in an accessible position. It should be adequately ventilated and provided with anti-condensation metal clad heaters with thermostatic control. All components inside shall be protected against corrosion, deterioration due to condensation, fungi etc. The door shall be pad-lockable.

b) The tap change mechanism shall be designed in such a way that when a tap change has been initiated, it will be completed independently of the operation of the control relays and switches. If a failure of the auxiliary supply during tap change or any other contingency would result in that movement, not being completed, an approved means shall be provided to safeguard the transformer and its auxiliary equipment.

c) Limit switches shall be provided to prevent over-running of the tap changing mechanism. These shall be directly connected in the operating motor circuit. In addition, mechanical stops shall be fitted to prevent over-running of the mechanism under any condition. For on-load tap change equipment, these stops shall withstand the full torque of the driving mechanism without damage to the tap change equipment. Limit switches may be connected in the control circuit of the operating motor, provided that a mechanical de-clutching mechanism is incorporated.

d) Thermal devices or other approved means shall be provided to protect the motor and control circuit.

e) A permanently legible lubrication chart shall be provided and fitted inside the tap-changing chamber.

3. TAP CHANGE CONTROL PHILOSOPHY:-

1) General:

The following operating conditions are applicable to the on-load tap changer controls:-

a) It must not be possible to operate the electric drive when the manual operating gear is in use.

b) It must not be possible for two electric control points to be in operation at the same time.

c) Operation from a control switch shall cause one tap movement only unless the control switch is returned to the off position between successive operations. Subsequent tap changes shall be initiated only by a new or repeat command.

d) It shall not be possible for any transformer operating in parallel with one or more other transformers in a group to be more than one tap out of step with the other transformers in the group. On load tap changers shall be equipped with a time delayed INCOMPLETE STEP alarm, consisting of a normally open contact which closes if the tap changer fails to make a complete tap change. The alarm shall not operate for momentary loss of auxiliary power.

e) All electrical control switches and local manual operating gear shall be clearly labelled in an approved manner to indicate the direction of tap changing i.e., raise and lower tap number.

2) Manual Control:

a) The cranking device for manual operation of the OLTC gear shall be removable and suitable for operation by a man, standing at ground level.

b) The manual control shall be considered as back up to the motor operated control and shall be inter locked with the motor to block motor start up during manual operation. The manual operating mechanism shall be labelled to show the direction of operation for raising the terminal voltage and vice-versa.

c) Manual tap position indicator which shall be complete with the following: -

i. Mechanical tap position indicator which shall be clearly visible from near the transformer.

ii. A mechanical operation counters.

iii. Mechanical stops to prevent over-cranking of the mechanism beyond the extreme tap positions.

3) Local and Remote Control:

Equipment for local, manual and electrical operation shall be provided in an outdoor cubicle. Electrical remote-control equipment shall also be supplied on the tap changer. The following control facilities shall be provided: -

a) 'Local - Remote' Selector Switch, mounted in the local OLTC, control cabinet. When the selector switch is in 'local' position, it shall be possible to operate the 'raise-lower' control switches, specified in (b) below. Remote control of the raise- lower functions shall be inhibited. When the selector switch is in 'remote' position, the local OLTC control cabinet mounted 'raise-lower' switch, specified in clause (b) below shall be inoperative. Remote control of the raise/lower function shall be possible from the remote-control panel. The 'local-remote' selector switch shall have at least two spare contacts per position, which are closed in that position, but open in the other position.

b) A ‘raise-lower’ control switch/push button shall be provided in the local OLTC control cabinet. This switch shall be operative only when ‘local-remote’ selector switch is in ‘local’ position.

c) An ‘ON-OFF’ tap changer control switch shall be provided in the local OLTC control cabinet of the transformer. The tap changer shall be in operative in the ‘OFF’ position. The ‘OFF-ON’ switch shall have at least one spare contact per position, which is closed in that position, but open in the other position.

4) Remote group control:-

The offered OLTC control scheme shall have provision of remote electrical group control during the parallel operation of transformer. This is in addition to independent control of OLTC.

a) A four position selector switch having ‘Master’, Follower’, ‘Independent’ and ‘Off’ position shall be provided in the remote OLTC control panel for each transformer. This shall be wired to enable operator to select operation of OLTC in either ‘Master’, ‘Follower’, ‘Independent’ or,’Off’ mode.

b) Out of step relays with timer contacts shall also be provided to give alarm and indication in case tap position in all the transformers under group control are not in same position.

c) Master Position: If the selector switch is in Master position, it shall be possible to control the OLTC units in the OLTC units in the follower mode by operating the controls of the master unit. Independent operation of the units under Follower mode shall be prevented. However, the units under Independent mode will be controlled independently.

d) Follower Position: - If the selector switch is in follower mode, control of OLTC shall be possible only from panel of the Master Unit.

e) Independent Position: - In this position of selector switch, control of OLTC of individual unit only shall be possible.

4. Control Circuits:-

The control circuits shall comply with following conditions:-

a) An interlock to cut off electrical control automatically upon recourse being taken to the manual control.

b) Reinforcement of the initiating impulse for a tap changer, ensuring a positive completion, once initiated to the next (higher or lower) tap.

c) “Step-by-step” operation ensuring only one tap change from each tap changing impulse and a lockout of the mechanism if the control switch (or push button) remains in the “operation” position.

d) An interlock to cut out electrical control when it tends to operate the gear beyond either of the extreme tap positions.

e) An electrical interlock to cut-off a counter impulse for reverse step change being initiated during a progressing tap change and until the mechanism comes to rest and resets circuits for the new position.

f) Tap change in progress indication shall be provided by means of an indicating lamp at the purchaser’s control panel. Necessary contacts for this and for remote tap position indicator at purchaser’s control panel shall be provided by the Bidder.

g) Protective apparatus, considered essential by the Bidder according to specialties of the gear.

5. Indications: -

Apparatus of an approved type shall be provided on each transformer:-

a) To give indication mechanically at the transformer and electrically at the remote control point of the number of the tapping in use.

b) To give electrical indication, separate from that specified above, of tap position at the remote supervisory point. Suitable tap position transducer to be incorporated for indication.

c) To give indication at the remote control point and at the supervisory control point that a tap change is in progress, this indication to continue until the tap change is complete.

d) To give indication at the remote control point and at the supervisory control point when transformers operating in parallel are out of step.

e) To indicate at the tap change mechanism the number of operations, completed by the equipment. A six digit counter should be provided for this.

2) <u>LOCAL CONTROL CABINET</u>: -

The local OLTC control cabinet shall house all necessary devices, meant for OLTC control and indication. It shall be complete with the following: -

a) A circuit breaker/contactor with thermal overload devices for controlling the A.C. auxiliary supply to the OLTC motor.

b) Cubicle light with door switch.

c) Space heaters to prevent condensation.

d) Padlocking arrangement for hinged door of cabinet.

e) Cable terminal glands for power and control cables to the OLTC gear.

3) <u>REMOTE CONTROL PANELS:</u>-

a) All controls, alarms and indications for transformers shall be incorporated within the appropriate switchgear control panels. The supplier shall provide all indications, relays, switches etc. for remote indication and operation of the transformer from the substation control room. Comprehensive and detailed instructions shall be provided to the purchaser regarding correct installation of this remote panel.

b) The remote tap changer control panel shall be mounted in the purchaser's control room. Size and colour of the panel shall be to the approval of the purchaser.

c) Operation of remote control scheme shall be entirely suitable for the distance between the transformer and remote control panel. Details of the connection of the remote control panel to the transformer shall be provided by the supplier.

d) The standard requirements (which may be varied to suit manufacturer's design) shall be out lined in the following sub-clauses:

1. I**<u>NSTRUMENTS</u>**:

a) Voltmeter (voltage at the low voltage terminals of the transformer).

b) Tap position indicator

c) Conventional winding & oil temperature indicator.

2. **<u>RELAYS:</u>**

Automatic voltage control.

3. **CONTROLS:**
   a) Automatic/non-automatic voltage control selector switch.
   b) Remote/supervisory tap change control selector switch.
   c) Raise/lower push-buttons.
   d) Independent/Master/Follower selector switch.
4. **INDICATIONS AND ALARMS** :
   a) Tap changer on manual control - white lamp.
   b) Tap change in progress - white lamp.
   c) Tap change out of step-alarm.
   d) Cooling equipment running-white lamp.
   e) Cooling equipment failure-alarm.
   f) AVR reference voltage failure-alarm.
   g) Tap changer supply voltage failure-alarm.
   h) Tap change incomplete step-alarm.
5. **AUXILIARY SUPPLY FOR OLTC CONTROL AND POWER CIRCUIT** :-
   Auxiliary supplies as indicated in the specification will be provided by the purchaser at any one place. All loads shall be fed by one of the two feeders through an electrically interlocked automatic transfer switch, housed in the marshalling Kiosk. The design feature for the transfer switch shall include the following: -
   a) Provision for the selection of one of the feeders as normal source and the other as standby.
   b) Upon failure of normal source, the loads shall be automatically transferred after an adjustable time delay to the stand by source.
   c) Indication for failure of the normal source and for transfer to standby source and also for failure to transfer shall be provided locally as well as at the remote control panel.
   d) Automatic re-transfers to normal source with an adjustable time delay following re-energisation of the normal source.
   e) Both the transfer and the re-transfer shall be dead transfers and AC feeders shall not be paralleled at any time.
   f) Necessary isolating switches, MCBs and other components for the above power supply transfer arrangement shall be provided by the supplier.

4.7.4.4.14 SUPERVISORY CONTROL:-

1) **General:**-
   a) Tap change control equipment shall be suitable for supervisory control and indication with make before break multi-may switch-having one potential free contact for each tap position. This switch shall be provided in addition to any other switch/switches, which may be required in remote tap position indication.
   b) Transformer on-load tap changer shall be equipped with a fixed resistor network, capable of providing discrete voltage steps for input to the supervisory system.
   c) Transformer tap change control will be effected from the sub-station control room with facilities for remote control from the supervisory control centre. Provision for such supervisory control shall be included in this contract.
   d) The supervisory facilities, outlined in the following sub-clauses will be required and control circuit design must make provision for these.
2) **CONTROLS:**
   a) Tap change control remote/supervisory select/deselect:-

N.B. :- Selection of supervisory control shall render voltage control non-automatic.

b) Tap position Raise/lower.

3) **INDICATIONS AND ALARMS**:

a) Tap change remote/supervisory indication.
b) Tap position indication through appropriate transducer.
c) Tap change out of step alarm.
d) Tap changer auto/non-auto indication.
e) Independent/master/follower indication.
f) Tap change in progress indication.
g) AVR reference voltage failure alarm.
h) Tap changing incomplete (TCINCL).
i) Tap changer supply failure alarm.
j) Cooling equipment running indication.
k) Cooling equipment failure alarm.
l) All contacts for supervisory alarms and indications shall be potential free.

4.7.4.4.15 TERMINAL AND CONNECTION ARRANGEMENTS:

1) **RATING :** Current rating shall be 1.5 times the rated current of the transformer.

2) **OUTDOOR BUSHINGS**:

a) The electrical and mechanical characteristics of bushings shall be in accordance with IS: 2099 & IS: 3347 (Part-III/Section-I). Bushings must have been type tested successfully as per IS: 2099/IEC-60137.
b) Phase windings above 33 KV shall have fully rated porcelain condenser anti - fog type bushings as per IEC-137. These shall be provided with: -
   i. Oil-level gauges, clearly readable from ground level.
   ii. Oil filling plug and drain valve, if not hermetically sealed.
   iii. Test taps for measurement of capacitance and tan delta.
   iv. Bushings of identical rating shall be inter-changeable.
c) 33 KV bushings shall be OIP/ solid porcelain with polymer housing (anti fog type).
d) 220 KV bushing shall be RIP/ RIS with polymer housing (anti fog type).
e) Neutral bushings shall be of oil filled, communicating type.
f) When bushings have an under-oil end of re-entrant form, the pull through lead shall be fitted with a gas bubble deflector.
g) Porcelain used in bushing manufacture shall be homogenous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture.
h) Glazing of porcelain and bushings shall be of uniform brown colour, free from blisters, burrs and other similar defects. Bushings shall be designed to have ample insulation mechanical strength and rigidity for the condition under which they will be used.
i) Special precaution shall be taken to eliminate moisture from paper insulation during manufacture, assembly, transport and erection. The surface of all paper insulation shall be finished with non-hygroscopic varnish which can not be damaged easily.
j) No arcing horns shall be fitted to any bushing.
k) The bushings shall be removable without disturbing the turret type current transformers.
l) Bushing turrets shall be provided with vent pipes which shall be connected to route any gas collection through the Buchholz relay.

m) The neutral ends of star connected windings shall be connected at points which are from manholes in the cover and brought out via one outdoor bushing, rated as per IEC-76.

n) Maximum tan delta value for the Bushings at ambient Temp. shall be less than 0.004. No temperature correction factor shall be applied.

3) **TERMINAL CONNECTORS**:

a) Bushing terminals shall be provided with terminal connectors of approved type and size for connection to external parts. Terminal connectors, offered must have been successfully type tested as per IS: 5561.

b)

i. All castings shall be free from blow holes, surface blisters, cracks and cavities. All sharp edges and corners shall be blurred and rounded off. The aluminium alloy castings, if used, shall conform to designation A6 of IS: 617.

ii. No part of clamp shall be less than 10 mm. Thick.

iii. All ferrous parts shall be hot dip galvanised conforming to IS: 2633. Spring washers and H.T. bolts shall be dectrogalvanised conforming to IS: 1573.

iv. For bimetallic clamp, copper alloy linear of minimum thickness of 2 mm. Shall be cast integral with aluminum body.

v. Flexible connectors shall be made from tinned copper sheets.

vi. Size of terminal/conductor for which the clamp is suitable and rated current under site conditions shall be embossed/punched on each component of the clamp, except hardware.

vii. All current carrying parts shall be designed and manufactured to have minimum contact resistance.

viii. The short time rating of terminal connector shall not be less than the short time rating of respective bushing.

ix. Terminal connectors shall be subject to all type, routine and acceptance tests as per IS: 5561 (latest).

x. Malleable cast iron for terminal connectors or any of its parts and accessories shall not be acceptable.

xi. Bolts and Nuts used shall be of stainless steel or galvanized/passivated mild steel.

4) **TERMINAL MARKING:**

Transformer terminals are to be provided with phase markings to the requirements of IEC- 616 and are subject to the agreement of the purchaser. Transformer terminals shall be silver/tin-plated copper.

5) **NEUTRAL EARTHING:**

The neutral terminals shall be brought to ground level by a brass or tinned copper grounding bar of approved size which shall be supported from the tank with porcelain insulators and connected to purchaser's local earth grid. The supplier must liaise with the purchaser or its approved contractor to finalise the details of installation of this earthing and mounting of the outdoor neutral C.T. on this.

4.7.4.4.16 SPECIFICATION FOR CONTROL CABINETS:

a) Control cabinets shall be of the free standing floor mounting type.

b) Control cabinet of the operating mechanism shall be made out of 3 mm thick sheet steel or 10 mm thick aluminium plate or casting. Hinged door shall be provided with pad locking arrangement. Sloping rain hood shall be provided to cover all sides. 15

mm thick neoprene or better type of gaskets shall be provided to ensure degree of protection of at least IP-55 as per IS: 2147.

c) Bus bars shall be of tinned copper of adequate cross-section to carry the normal current without exceeding the permissible temperature rise over an ambient temperature of 50 degree centigrade outside the cubicle. The buses shall be braced to withstand forces corresponding to short circuit current of 25KA.
d) Motors rated 1 KW and above being controlled from the control cabinet would be suitable for operation on a 415V, 3 Phase, 50 HZ system. Fractional KW motors would be suitable for operation on a 240V, 1- Phase, 50 HZ supply system.
e) Isolating switches shall be group operated units (3 pole for use on 3-MCBS phase supply systems and 2 pole for single phase supply systems) quick make quick break type, capable of breaking safely and without deterioration, the rated current of the associated circuit. Switch handle shall have provision for locking in both fully open and fully closed positions.
f) Push button shall be rated for not less than 6 Amps. 415V A.C. or 2 Amps, 220/110V D.C. and shall be flush mounted on the cabinet door and provided with appropriate nameplates. Red, Green and Amber indicating lamps shall be flush mounted.
g) For motors upto 5 KW, contactors shall be direct-on-line, air break, single throw type and shall be suitable for making and breaking the stalled current of the associated motor which shall be assumed equal to 6.5 times the full load current of the motor at 0.2 p.f. For motors above 5 KW, automatic star delta type starters shall be provided. 3 Pole contactors shall be furnished for 3 Phase motors and 2 Pole contactors for single phase motors. Reversing contactors shall be provided with electrical interlocks between forward and reverse contactors. If possible, mechanical interlocks shall also be provided. Contactors shall be suitable for uninterrupted duty and shall be of duty category class AC4 as defined in IS: 2959. The main contacts of the contactors shall be silver plated and the insulation class for the coils shall be class E or better. The dropout voltage of the contactors shall not exceed 70% of the rated voltage.
h) Contactors shall be provided with a three element positive acting, ambient temperature compensated, time lagged, hand reset type, thermal overload relay with adjustable setting. Hand reset button shall be flush with the front door of the cabinet and suitable for resetting with starter compartment door closed.
i) Single phase preventer relay shall be provided for 3 Phase motors to provide positive protection against single phasing.
j) Mini starters shall be provided with no volt coils, whenever required.
k) Purchaser's power cables will be of 1100/650 Volts grade stranded aluminum conductor PVC insulated, PVC sheathed, single steel wire armoured and PVC jacketed. All necessary cable terminating accessories such as glands, crimp type tinned copper lugs etc. for power as well as control cables shall be included in Bidder's scope of supply. Suitable brass cable glands shall be provided for cable entry.
l) Wiring for all control circuits shall be carried out with 1100/650 Volts grade PVC insulated tinned copper stranded conductors of sizes not smaller than 2.5 mm. At least 20% spare terminal blocks for control wire termination shall be provided on each panel. The terminal blocks shall be of non-disconnecting stand type. All terminals shall be provided with ferrules, indelibly marked or numbered and these

identifications shall correspond to the designations on the relevant wiring diagrams. The terminals shall be rated for adequate capacity which shall not be less than10Amps.

m) Separate terminal blocks shall be provided for terminating circuits of various voltage classes. CT loads shall be terminated on a separate block and shall have provision for short circuiting the CT secondary terminals.

n) Control cabinet shall be provided with 240V, 1 Phase, 50 HZ, 20 W fluorescent light fixture and a suitably rated 240 V, 1 Phase, 5 Amps, 3 Pin socket for hand lamps.

o) Strip heaters shall be provided inside each cabinet complete with thermostat (preferably differential type) to prevent moisture condensation. Heaters shall be controlled by suitably rated double pole miniature circuit breakers.

p) Signal lamps, provided shall be of neon screw type with series resistors, enclosed in bakelite body. Each signal lamp shall be provided with a fuse, integrally mounted in the lamp body.

q) Electric measuring instruments shall be of moving iron type. Ammeters for measuring current upto 30 Amps shall be directly connected while those for measuring above 30 Amps shall be connected through suitable CTs. Ammeters shall be provided with selector switches.

r) Items inside the cabinet, made of organic material shall be coated with a fungus resistant varnish.

4.7.4.4.17 <u>INSULATING OIL</u>:-

a) The quality of the oil, supplied with the transformer shall conform to IEC 296 (Mineral oil class 1) and IS: 335 with latest amendment, if any. The percentage of Naphthenic content in the oil will be more than 40 percent and paraffinic content will be less than 56 percent. No oil shall be supplied or used at any stage of manufacture or test without a certificate, acceptable to the Purchaser that it has a PCB content of less than 2 mg/kg. No inhibitors shall be used in the oil. The oil samples will be drawn as follows:-

i. Prior to filling.
ii. Before and after heat run test.
iii. Before energising.

All tests as per relevant IEC & ISS shall be conducted on all samples.

b) Sufficient quantity of oil, necessary for first filling of all tanks, coolers and radiators at the proper level along with 10% extra oil for topping up shall be supplied in non-returnable containers, suitable for outdoor storage.

c) The supplier shall despatch the transformer, filled with oil or in an atmosphere of Nitrogen. In the former case, the Bidder shall take care of the weight limitation on transport and handling facility at site. In the latter case, necessary arrangement shall be ensured by the supplier to take care of pressure drop of nitrogen during transit and storage till completion of oil filling during erection. A gas pressure testing valve with necessary pressure gauge and adapter valve shall be provided.

d) **The transformer shall also be fitted with an impact recorder during transportation. This impact recorder is on returnable basis.**

e) The Bidders shall ensure that the oil supplied is in accordance with the latest editions of the following specifications with amendments, if any.

Sl. No.	Characteristics	Requirement.	Method of Test.
1	Appearance	The oil shall be clear and transparent & free from suspended matter or sediments.	A representative sample of oil shall be examined in a 100mm thick layer at ambient temperature.
2	Density at 27°C (Max)	0.89 g/cu.cm.	IS: 1448
3	Kinematic viscosity at	27Cst.	IS: 1448 27° C (max.)
4	Interfacial tension at 27° C (min.)	0.04 N/m	IS: 6104
5	Flashpoint penskey Marten (closed) (min.)	140° C	IS: 1448
6	Pour point (max.)	-6 ° C	IS: 1448
7	Neutralization value (max.) (Total acidity).	0.03 mg KOH/g	IS: 335
8	Corrosive Sulphur (In terms of classification of copper strip)	Non-corrosive	IS: 335 (Appendix 'B')
9	Electric strength (break down voltage) min.		
a)	New unfiltered oil.	30 KV (rms) if the above value is not attained, the oil shall be filtered)	IS: 6792.
b)	After treatment.	60KV (rms)	
10	Di-Electric dissipation factor (tan delta) at 90 deg.C (max.)	0.002	IS: 6262
11	Specific resistance (resistivity)		
a)	at 90 deg.C (min.)	35×10^{12} Ohm-cm.	IS: 6103
b)	at 27 deg.C (min.)	1500×10^{12} Ohm-cm.	
12	Oxidation stability.		
a)	Neutralization value after oxidation (max.)	0.4 mg KOH/g.	
b)	Total Sludge after oxidation (max.).	0.10% by weight.	
13	Presence of Oxidation inhibitor	The oil shall not contain anti oxidant inhibitors.	IS: 335 (Appendix 'D')
14	Water content (max.)	a) Untreated and unfiltered Oil- 50 ppm. b) Before commissioning- 10 ppm.	IS: 2362
15	Aging characteristics after 96 hrs. with catalyst (Copper)	As per AS TMD/934/ IS: 12177	
a)	Resistivity.		
i)	27 deg.C	$2.5 \times (10)^{12}$ Ohm-cm.	

	ii)	90 deg.C	0.2 x $(10)^{12}$ Ohm-cm.	
	b)	Tan delta at 90 deg.C	0.2 (max.).	
	c)	Total acidity.	0.05 mg KOH/gm (max.)	
	d)	Sludge content by weight.	0.05% (max.)	
16	a)	Napthenic content	More than 40%	Spectroscopic method or any other prescribed method
	b)	Paraffinic content	Less than 56%	

The Test certificates to conform the quality of the oil shall be submitted by the supplier. The purchaser at his discretion may depute his representative for witnessing the tests at the works of the supplier or its sub-vendor. The purchaser's representative may recommend for testing of sample oil at CPRI/ERDA including ensuring the percentage of and paraffinic content in the offered oil. The cost for such testing shall be borne by the supplier. The purchaser at his discretion may also get the supplied oil, tested at Govt. approved laboratory for determination of quality, napthenic and paraffinic contents as per specification.

4.7.4.4.18 <u>CLEANING, PAINTING AND TROPICALISATION</u>:-

a) All steel surfaces except galvanized surfaces or where otherwise specified, shall be shot blasted to remove all rust, scale and foreign matters from the surface. Oil, grease, dirt and swarf shall be thoroughly removed by emulsion cleaning. The surfaces shall then be chemically cleaned and surface treated by phosphating and dried in accordance with IS-6005 - "Code of practice for phosphating of iron and steel". Immediately after phosphating, the surfaces shall be given two coats of high quality zinc chromate primer.

b) The interior surfaces of mechanism chambers, boxes and kiosks, after preparation, cleaning and priming shall be painted with one coat of zinc chromate primer, one coat of phenolic based undercoating, followed by two coats of phenolic based finishing paint to white colour, followed by a final coat of anti-condensation white paint of a type and make to the approval of the Purchaser. A minimum overall paint film thickness of 200 microns shall be maintained throughout.

c) All steel work and metal work, after preparation and priming shall be painted with one coat zinc chromate primer, one coat of phenolic based under coating and two coats of micaceous iron oxide paint to an overall thickness of 200 microns to hard gloss finishing Light Grey Shade No. 697 of IS:5. Each successive coat of paint shall be of slightly different shade to enable inspection. The finished surface shall present a pleasing appearance free from dents or unevenness surfaces.

d) It is the responsibility of the supplier to ensure that the quality of paints used shall withstand the tropical heat and extremes of weather conditions. The paint shall not peal-off, wrinkle, be removed by wind, storm and handling on site and the surface finish shall neither rust nor fade during the service life of the equipment.

e) After erection at site, the interior surfaces of mechanism chambers and kiosks shall be thoroughly examined and any deteriorated or mechanically damaged surfaces of such shall be made good to the full specification, described above.

f) After erection at site, all surfaces of steel works and metal works shall be thoroughly washed down and examined. Any deteriorated or otherwise faulty paint work shall be removed down to bare metal and made good to the full specification described above, then painted one further coat of phenolic based under coating and one coat phenolic

based hard gloss finishing paint to provide an overall minimum paint film thickness of 200 microns.

g) All paint work shall be left clean and perfect on completion of the site works.

4.7.4.4.19 BOLTS AND NUTS:-

a) All bolts, studs, screw threads, pipe threads, bolt heads and nuts shall comply with the appropriate Indian Standards for metric threads, or the technical equivalent.

b) Except for small wiring, current carrying terminal bolts or studs for mechanical reasons shall not be less than 6 mm in diameter.

c) All nuts and pins shall be adequately locked.

d) Wherever possible, bolts shall be fitted in such a manner that in the event of failure of locking resulting in the nuts working loose and falling off, the bolt will remain in position.

e) All bolts, nuts and washers, placed in outdoor positions shall be treated to prevent corrosion, by hot dip galvanizing. Bolts and Nuts below M12 (12mm.) size shall be of stainless steel. Appropriate precautions shall be taken to prevent electrolytic action between dissimilar metals

f) Where bolts are used on external horizontal surfaces and where water can collect, methods of preventing the ingress of moisture to the threads shall be provided.

g) Each bolt or stud shall project at least one thread, but not more than three threads through the nut, except when otherwise approved for terminal board studs or relay stems. If bolts or nuts are placed so that they are inaccessible by means of ordinary spanners, special spanners shall be provided.

h) The length of the screwed portion of the bolts shall be such that no screw thread may form part of a shear plane between members.

i) Taper washers shall be provided where necessary.

j) Protective washers of suitable material shall be provided front and back on the securing screws.

4.7.4.4.20 WIRING AND CABLING:-

a) Cable box/sealing end shall be suitable for following types of cable.

i)	415 Volt Power	1100 Volt grade PVC Insulated aluminum conductor cable with armour.
ii)	Control.	1100 Volt grade PVC insulated 7/0.737 mm stranded copper conductor cable with armour.

b) Compression type cable connector shall be provided for termination of power and control cables.

c) All controls, alarms, indicating and relaying devices, provided with the transformer shall be wired up to the terminal blocks inside the local control cabinets (both cooler and OLTC control cabinets).

d) All devices and terminal blocks with the cooler control cabinet shall be clearly identified by symbols, corresponding to those used on applicable schematic or wiring diagrams.

2) **EXCLUSION IN SCOPE OF CABLING:**

Following cabling works are specifically excluded from the scope of the supplier. However, interconnection drawings for the same are to be submitted by the supplier

a) Cabling between Remote OLTC panel to cooler control cabinet.

b) Cabling between Remote OLTC panel to local OLTC cabinet.

c) Cabling between Remote OLTC to supplier's panel.

d) Cabling between cooler control cabinet to supplier's panel.
e) Cabling between local OLTC cabinet to supplier's panel.

4.7.4.4.21 <u>FITTINGS</u>:

The following fittings shall be provided with each transformer, covered in this specification.

a) Conservator for main tank with oil filling hole and cap, vacuum application valve, vacuum equalizing valve, isolating valves, drain valve, shut off valve, magnetic oil level gauge with low level alarm contacts, dehydrating breather, with oil seal.
b) Conservator for OLTC with drain valve, surge relay (oil flow operated), vacuum application valve, vacuum equalizing valve, magnetic type oil level gauge with low level alarm contacts, oil-level indicator and silica gel breathers.
c) Oil preservation equipment.
d) Pressure relief device with alarm/trip contact.
e) (i) Buchholz relay, double float/read type with isolating valves on both sides, bleeding pipe with pet cock at the end to collect gases and alarm and trip contacts (Rating 1 Amp. 220V DC) test cock, gas collection box and gas check valve at ground level.
(ii) Separate Oil Surge Relay with above features to be provided for OLTC chamber.
f) Air release plug.
g) Inspection openings and covers.
h) Bushing with metal parts and gaskets to suit the termination arrangement.
i) Winding temperature indicators for local and remote mounting. One RWTI with a four point selector switch shall be provided for three windings.
j) Top Oil temperature indicators with maximum pointer along with two sets of contactors.
k) Cover lifting eyes, transformer lifting lugs, jacking pads, towing holes and core and winding lifting lugs.
l) Protected type mercury or alcohol in glass thermometer.
m) Bottom and top filter valves with threaded male adoptors, bottom sampling valve and drain valve.
n) Rating and diagram plates on transformers and auxiliary apparatus.
o) Earthing terminals.
p) Flanged bi-directional wheels.
q) Cooler Control Cabinet with pad locks.
r) On load tap changing equipment and OLTC control cabinet with pad locks.
s) Drain valve plugs shall be provided in order that each section of pipe work can be drained independently.
t) Insulating Oil.
u) Terminal marking plate.
v) Jacking pads//lugs
w) Lifting bollards.
x) Haulage lugs.
y) Cover lifting lugs.
z) Valve schedule plate.
aa) Valves, as indicated at Cl.No.5.4.2 of this specification.
bb) Wiring up to marshalling box with PVC SWA PVC copper cables, 1100 volts grade.
cc) RTCC Panel
dd) Bushing Terminal Clamps & Connectors

ee) Valves, as indicated at Cl.No.5.4.2 of this Specification

ff) Wiring upto marshalling box with PVC SWA PVC copper cables, 1100Volts grade.

Note: - The fittings listed above are only indicative and any other fittings which generally are required for satisfactory operation of the above rated power transformers are deemed to be included.

4.7.4.4.22 <u>LIMITS OF TEMPERATURE RISE</u>.:-

The temperature rise on any part of equipment shall not exceed the maximum temperature rise specified below under the conditions specified in test clauses. The permissible temperature rise indicated is for a maximum ambient temperature of 50 degree C. If the maximum ambient temperature rises, permissible values shall be reduced accordingly. For actual maximum temperature at the location of installation, refer perfect synopsis.

Sl. No.	**Nature of the part or of the liquid**	**Maximum value of:**	
		Temperature.	Temp. rise at a max. ambient air temp. not exceeding 50^{o} C
1	Contacts in air, silver-faced copper, copper alloy or aluminium alloy (see notes (i) & (ii).	95	40/45
2	Bare copper of tinned aluminium alloy. Contacts in oil: Silver-faced copper, copper alloy or aluminium alloy [see note-(i)].	75 90 80	25 40 30
3	Terminals to be connected to external conductors by screws or bolts silver faced (see note (iii).	105	55
4	Metal parts acting as springs.	(See note iv).	(See note iv).
5	Metal parts in contact with insulation of the following classes:		
	Class Y : (for non-impregnated materials).	90	40
	Class A: (for materials immersed in oil or impregnated.	100	50
	Class E: in air	120	70
	in oil	100	50
	Class B: in air	130	80
	in oil	100	50
	Class F: in air	155	105
	in oil	100	50
	Enamel: oil base	100	50
	Synthetic, in air	120	70
	Synthetic, in oil	100	50
6	Any part of metal or of insulating material in contact with coil, except contacts.	100	50
7	Oil	90	40

Notes:

i. When applying the temperature rise of 45° C, care should be taken to ensure that no damage is caused to the surrounding insulating materials.

ii. The quality of the silver facing shall be such that a layer of silver remains at the points of contact after the mechanical endurance test. Otherwise, the contacts shall be regarded as 'bare'.

iii. The values of temperature and temperature rise are valid whether or not the conductor connected to the terminals is silver-faced.

iv. The temperature shall not reach a value where the elasticity of the material is impaired. For pure copper, this implies a temperature limit of 75°C.

4.7.4.4.23 MOTORS & MCBS:

a) All motors shall comply with IS: 325 and IEC 34 and dimensions with IEC-72. They shall be capable of operating continuously under actual service conditions without exceeding the specified temperature rises, determined by resistance, at any frequency between the voltage and frequency fluctuation, stated in this specification.

b) All miniature circuit breakers shall be provided with auxiliary contacts for remote indication of circuit breaker operation. Means shall be provided to prevent the miniature circuit breakers, being inadvertently switched to the 'OFF' Position. Miniature circuit breakers shall be mounted in such a manner so as to give easily visible indication of breaker position and shall be grouped and spaced according to their function in order to facilitate identification and easy replacement.

4.7.4.4.24 LIST OF MANDATORY SPARES FOR EACH UNIT OF TRANSFORMER

The supplier shall provide the mandatory spares, detailed below and shall, where considered necessary, provide a list of recommended spare parts together with their individual prices. The purchaser may order all or any of the spare parts, listed at the time of contract award and the spare parts, so required by the purchaser, shall be supplied as part of this contract. Additional spares may be ordered at anytime during the contract at the rates, stated in the purchase order.

Sl. No.	Description	Quantity
1	245kV HV Bushing with metal parts & gaskets	3 Nos.
2	36kV LV Bushing with metal parts & gaskets	3Nos.
3	52kV HV Neutral Bushing with metal parts & gaskets	3 Nos.
4	36kV LV Neutral Bushing with metal parts & gaskets	3 Nos.
5	Local & remote winding Temperature indicators with contacts	1 set
6	Oil Temperature indicators with contacts	1set
7	Pressure Relief Device	3 Nos.
8	Magnetic oil level gauge with low oil level alarm contacts	1 No.
9	Cooler fan with motor	3 Nos.
10	Buchholz relay	3 Nos.
11	Tap position Indicator (Local & Remote)	3 Nos.

N.B. –

a) The Supplier shall ensure that sufficient spare parts and consumable items are available for his own use during commissioning of the transformer. The spares, provided with the transformer shall not be used by the supplier without the written consent of the Purchaser and any spares, used during the commissioning of the transformer shall be replaced by the supplier at his own expense.

b) The Supplier shall provide a list in the schedule, of additional recommended spare parts together with their individual prices. The Purchaser may order at a later date, at a price, indicated on the schedule, such additional spare parts, listed at the time of contract award.

c) Spares shall be available during the life of the equipment and the Supplier shall give 12 months notice of his or any Sub-Suppliers, intention to cease manufacture of any component used in the equipment.

d) Any spare apparatus, parts and tools shall be subject to the same Specification, tests and conditions as similar material, supplied under this contract. They shall be strictly interchangeable and suitable for use in place of the corresponding parts, supplied with the transformer and must be suitably marked and numbered for identification and prepared for storage by greasing and painting to prevent deterioration.

e) All spare apparatus or materials, containing electrical insulation shall be packed and delivered in cases, suitable for storing such parts or material over a period of years without deterioration. Such cases shall have to be affixed to both the underside and topside of the lid a list detailing its contents. The case will remain as the property of the Purchaser.

4.7.3.5 CENTRE OF GRAVITY:

The center of gravity of assembled transformers shall be as low and as near the vertical center line as possible. The transformer shall be stable with and without oil. The location of the center of gravity, relative to track shall be clearly marked in the outline drawing, accompanying bid.

4.7.4 INSPECTION AND TESTING:-

4.7.5.1 TESTING FACILITIES:-

1) **Bidders shall submit along with the bid, the details of testing facilities, available at their works for carrying out all the routine and type tests, as specified.**
2) **In case, the test facilities for any particular test are not available at the bidder's works, this shall be clearly brought out in the additional information schedule and proposed arrangement of carrying out that test shall be clearly indicated**.
3) **All the measuring systems, used for the tests have certified, traceable accuracy and are subjected to periodic calibration, according to the rules of 4.11 of ISO 9001[Ref-Cl.No.10 (Tests) of IEC-60076-1]**

4.7.5.2 GENERAL:-

Inspection and testing shall be carried out on the transformer as detailed here and generally in accordance with IEC 76 and IS: 2026. The Purchaser shall have the right to reject the transformer, if test results do not comply with the standards/values, specified and information/data, given in the schedules. For the purpose of determining when type tests are required, a transformer is considered to be representative of others only if it is fully identical in design, rating and construction.

Before and after acceptance testing, samples of oil shall be taken from the transformer and analysed for dissolved gases, using the procedures, specified in IEC Publications 567 and 599. Results of the analysis of gases, dissolved in the oil shall be immediately submitted to the Purchaser and included in the Acceptance Test Report. On completion of acceptance testing, the Supplier shall provide the Purchaser with seven copies of the complete test reports.

Full details of the proposed methods of testing including connection diagrams shall be submitted by the Supplier for approval at least one month before testing. All tests will be witnessed by the Purchaser.

The Purchaser shall have full access at all times to the works and all other places of manufacture of the transformers. The Supplier shall report to the Purchaser monthly or other period, as agreed between the two on manufacturing progress. The Supplier shall give the Purchaser on award of contract a complete manufacturing inspection program to allow the Purchaser, at its discretion, to inspect at all stages of transformer manufacture.

4.7.5.3 <u>STAGE INSPECTION</u>: -

Stage inspection on core, windings, tank, OLTC and all other accessories etc. will be carried out by the Supplier in the presence of OHPC's representative on free of cost to OHPC before tanking of the core and windings. All the measurements will be taken on the above components, so as to ensure their compliance to the above Specification and the Guaranteed Technical Particulars. The possible routine tests like measurement of D.C. resistance, no load current and no load loss, determination of Knee Point Voltage, specific core loss, tank tests etc. will be conducted during stage inspection. For determination of number of turns in the windings, the manufacturer shall provide dummy core, so as to accommodate the LV winding and determining the ratio between the unknown No. of turns (winding) and known No. of turns, wrapped around the LV winding. The purchaser's representative at his discretion may choose small strips of core for testing at CPRI/ERDA. Also, a small piece of conductor for each type of winding and core material shall be made available to the purchaser's representative. Apart from the above, the purchaser at his discretion reserves the right to carry out the stage inspection at other stages also, for which advance intimation shall be given and all necessary co-operation shall be rendered by the manufacturer. The Supplier shall give at least three weeks' notice in advance for deputing Inspecting Officer(s) to their works. Type Tests and routine tests on the transformer shall be conducted only if the stage inspection report and the pre-tanking tests are found to be in order as per this Specification.

4.7.5.4 <u>FINAL INSPECTION& TESTING</u>:-

Before offering for final inspection, type tests and routine tests, the Supplier shall furnish the factory test results (except dielectric tests) of the offered transformer(s) along with list of equipments/meters/instruments, to be used, during testing (both routine and type tests) as per Annex of this Specification along with calibration certificates of measuring instruments. The Purchaser may direct the Supplier for use of better equipments/meters during inspection/testing. The calibration of all the meters/instruments to be used during testing should have been done in Government approved laboratory.

1) **<u>TYPE TESTS & SPECIAL TESTS:-</u>**

The followings shall be regarded as type tests and shall be carried out in any Govt./ NABL accredited laboratories & the test report shall be submitted in the bid document.

a) **<u>Temperature Rise Test</u>**:-

This test shall be carried out on the tap giving the worst combination of loading on the transformer windings. The transformer shall be tested by feeding the tested losses or quoted losses, whichever is higher. The supplier, before carrying out such tests, shall submit detailed calculations, showing the alternatives possible on

various taps and for the ratings (OFWF) of the transformer and shall recommend the combination that results in highest temperature rise for the test. Temperature rise shall be measured at OFWF ratings. Gas chromatographic analysis on oil shall be carried out before and after the temperature rise test and the results recorded in the test report. Sampling shall be in accordance with IEC 60567. For evaluation of the gas analysis in temperature rise test, the procedure shall be as per IS: 9434 (based on IEC: 60567) and the results will be interpreted as per IS: 10593 (based on IEC-60599). These results shall be treated as reference during future maintenance of Transformers. The calibration of OTI and WTI shall be done by transformer manufacturer and these calibrated OTI, WTI shall be used during testing of the transformer. The Sr. No. of WTI and OTI should be recorded during testing of the Transformer and only these OTI & WTI shall be supplied with the Transformer.

b) **Measurement of Zero Sequence Impedance:-**
Measurement of open circuit and short circuit zero sequence impedances of the primary and secondary windings.

c) **Auxiliary Power Consumption:-**
Measurement of power taken by fans.

d) **Vacuum Test:-**
One transformer tank of each size shall be subject to full vacuum and tested at an internal pressure of 3.33 KN/Sq.m. (25 Torr) for one hour. The permanent deflection of plates after the vacuum has been released shall not exceed the values, specified below and the performance of the transformers shall not be affected in any way.

Horizontal length of flat plate (mm.)	Permanent deflection (mm.)
Upto and including 750	5.0
751 to 1250	6.5
1251 to 1750	8.0
1751 to 2000	9.5
2001 to 2250	11.0
2251 to 2500	12.5
2501 to 3000	16.0
Above 3000	19.0

The purchaser at his discretion may opt for vacuum test for the tanks of all the transformers, by paying extra cost to the supplier at their quoted price(s).

e) **Pressure Test:-**
One transformer tank of each size together with its radiators, conservator vessel and other fittings shall be subjected to a pressure, corresponding to twice the normal head of oil or to the normal pressure plus 35KN/Sq.m. whichever is lower. The applied pressure shall be measured at the base of the tank and maintained for one hour. The permanent deflection of flat plates after excess pressure has been released shall not exceed the values, specified in (d).
The purchaser at his discretion may opt for pressure test for the tanks of all the transformers, by paying extra cost to the supplier at their quoted price(s).

f) **IP-55 Test:-**
One cooler control cabinet and OLTC cabinet for each type of transformer shall be tested for IP-55 protection in accordance with IS-2147/IEC-529.

N.B.:-

1. The transformer offered or higher capacity (Both MVA & voltage rating) should have been tested as per the above type tests [6.4.1(a) to (f)] and chopped Lightning Impulse tests, as prescribed in this specification in presence of authorized representative(s) of Government Utilities. The bidder shall furnish four sets of such type & special test reports including Lightning Impulse Test Report (chopped Impulse) (indicating therein the type and design details) along-with the offer without which the tender may be rejected. These tests should have been conducted not before five years from the date of opening of bid.
2. Test reports towards all type tests as per IEC-214: 1976 and BS: 4571:1970 for the offered OLTC along with approved drawings to be submitted. Purchaser at his discretion may insist on repetition of some or all the applicable type tests as per above IEC & BS, at supplier's cost, if any discrepancy/deviation/deficiency is noticed in the type test reports.
3. If it is desired by the Purchaser that the 'Short Circuit Test' at CPRI, Bangalore/Bhopal needs to be conducted on any unit, randomly selected for 'Short Circuit Test', the firm will make all necessary arrangements for above Test and expenditure on above will be reimbursed by OHPC on actual basis.

2) **ROUTINE TESTS**:-

The followings shall be regarded as routine tests and shall be conducted on each transformer in the presence of purchaser's representative. No extra cost shall be paid for these tests.

a) **Measurement of winding resistance at all taps.**

b) **Voltage- ratio measurement and check of vector group.**

c) **Measurement of capacitance and dielectric dissipation factor**. (Before and after the series of dielectric tests). The capacitance test shall be carried out with the help of ampere turn bridge method on fully assembled transformer (filled with oil) to determine capacitance and tan delta between winding and earth as under:

- **i.** HV winding with LV winding and tank earthed.
- **ii.** LV winding with HV winding and tank earthed.
- **iii.** HV and LV windings with tank earthed.

d) **Measurement of Insulation Resistance and Determination of Polarisation Index: -** This measurement shall be made with ten minute and one minute IR tests and should be repeated after all other tests.

e) **Impulse Test:**

- **i.** Full Wave Impulse Voltage withstand Test: - The test voltage shall be applied to each line. The applied voltage shall be the relevant lightning impulse voltage, specified in the schedule of requirements. This test shall be applied to each HV & LV Phase terminal.
- **ii.** Chopped wave impulse voltage withstand test: - The test voltage shall be applied to each line terminal. The applied voltage shall be 110% of the specified relevant lightning impulse voltage. This test shall be applied to each HV & LV Phase terminal.
- **iii.** An impulse test on transformer neutrals as per IEC-76-3 Clause 12.3.2 shall be carried out.

  Tests (i) and (ii) shall be combined in a single sequence as follows for each line terminal:-

1. One reduced full impulse (calibration).
2. One 100% full impulse.
3. One or more reduced chopped impulse(s).
4. Two 100% chopped impulses.
5. Two 100% full impulses.

The sequence for test (iii) shall be as follows:-

1. One reduced full impulse at 50-75% of full level.
2. Three 100% full impulses.

In carrying out the above tests, the two extreme taps and another tap to be selected by the purchaser with each of the three phases, being tested on a different tap.

f) **Separate source voltage withstand test:-**
The applied voltage shall be the specified/relevant power frequency voltage.

g) **Induced over-voltage withstand test:-**
The above Test shall be carried out as per IEC-76-3. The firm shall have to submit the over-potential diagram with details of calculation and explanation alongwith the offer for inspection.

h) **Partial discharge test:-**
This test shall be carried out using a broad band instrument. The voltage time envelope shall be as described in clause 11.4 of IEC 76-3. The apparent charge (q) shall be in accordance with IEC 76-3.

i) **Measurement of Impedance voltage on all taps.**

j) **Measurement of the load loss** at normal tap and extreme taps. (To be carried out by three wattmeter method with low power factor wattmeter's at full rated current). The voltage, current, wattage, power factor and frequency meter reading in individual phases (u, v, w) shall be recorded during testing and shall be reflected in the test report.

k) **Measurement of no load loss, no load current and determination of knee point voltage: -**
This test is to be carried out with three wattmeter method/Power Analyser by using low power factor watt meters, three power factor meters, phase sequence meters, three low range ammeters and three each of average value and RMS value voltmeters. The test voltage from 10% voltage to 125% voltage shall be applied and currents, voltages (Average value and RMS value), watt meters, power factor and frequency meter readings in all the three phases are to be recorded during the test. A saturation characteristic curve between the no load voltage (rms) vs. Measured current is to be plotted on the graph sheet, so as to determine the voltage at which increasing voltage by 10% (ten percent), the excitation current shall not increase by more than 50% (fifty percent). The knee point voltage as per specification will be complied if the excitation current at 121% of rated no load voltage shall not exceed by not more than 50% over the excitation current, obtained at 110% of the rated no load voltage. During the no load test, supplier's own generator set shall be used for feeding the above no load voltages at rated frequency. If the applied frequency is greater than the rated frequency, then proportionate voltage as per the rated frequency will be fed during the above no load test and following frequency correction formula along with the formula, stipulated at Clause No 16.5 of IS:2026 (Part-I) shall be used.

$K = 0.5 [(f/f\ 1) + (f/f\ 1)^2]$

Where f = rated frequency and f 1 = applied frequency.

For Example: - If measured loss = X Watts, correction factor due to R.M.S. and average voltage as per ISS = K1 and frequency correction factor = K as per above formula, then corrected loss will be calculated as = measured loss • K1 • K.

If applied frequency is less than the rated frequency, no frequency correction formula will be applied. Rated voltage at that frequency will be fed during the no load test.

N.B. –

1. If power analyser is to be used for determination of no load loss, no load current, Impedance Voltage, short circuit losses etc., its manual of operation, calibration certificate and the relevant standard for its use shall be produced prior to one month of test offer for studying its feasibility and reliability.
2. C.Ts. and P.Ts. of accuracy class 0.2 or better as per IS: 2705 are to be used during determination of no load losses and short circuit losses which involves financial implication. The calibration certificates of these C.Ts. & P.Ts. from independent Government approved laboratory shall be produced along with the traceability while offering for inspection. The accuracy class of reference standard C.T. & P.T. used for determination of the errors of the above C.Ts. & P.Ts. shall be 0.05 or better as per Clause No.2.9 of IS : 1248 (Part-9).

l) **Measurement of Harmonic level** (1^{st} to 24^{th} Harmonic) in no-load current in all three phases at 90%, 100% and 110% of no-load voltage. The magnitudes of no load currents for all the three phases at the above excitation levels shall also be recorded and reflected in the test report for measurement of harmonic levels.

m) **Measurement of capacitance and dielectric dissipation factor [Repeat © above).**

n) **Measurement of polarisation Index (Repeat (d) above).**

o) **Tests on no-load tap-changer (as per IS: 2026)**

p) **Transformer noise measurement:-**
Noise level measurement in accordance with IEC Publication 551 using a precision sound level meter conforming to IEC Publication 651.

q) **Auxiliary circuit tests:-**
All auxiliary circuits shall be subjected to application of 2KV (rms) withstand test voltage. Correct operation of all auxiliary control circuits will be tested.

r) **Core earth test:-**
A test voltage of 2KV shall be applied between the core and the earthed structural steel work to prove that the core is earthed through the removable link, at one point only.

s) **Oil BDV test.**

t) **Measurement of Neutral current** during load loss test, which shall not be more than 2% of the rated current of the transformer.

u) **Magnetic balance test.**

v) **DGA test before and after all the tests.**

w) **Oil Leakage test on transformer tank:-**
All tanks and oil-filled compartments shall be tested for oil tightness by completely filling with oil of viscosity, not greater than that of insulating oil, conforming to IS: 335 at the ambient temperature and as per this specification and applying a pressure, equal to the normal pressure plus 35KN/Sq.m., measured at the base of the tank. This pressure shall be maintained for a period of not less than 12 hours,

during which time, no leakage shall occur. Bidder shall arrange for witnessing the leakage test of each tank.

x) **Pressure Relief Device Test:-**

The pressure relief device of each size shall be subjected to increasing oil pressure. It shall operate before reaching the test pressure, specified at Cl.No.5.4.4 of this specification. The operating pressure shall be recorded. The device shall seal off after the excess pressure has been relieved. The following functional checks shall be conducted as acceptance tests on each of the pressure relief devices.

i. Air- Pressure Test.
ii. Liquid Pressure Test.
iii. Leakage Test.
iv. Contact Test.
v. Di-electric Test.

y) **Frequency Response Analysis (FRA) Test:-**

The supplier shall conduct the test at the time of final testing of the transformer and record the amplitude and phase shift results on CDS for subsequent analysis. The test shall also be carried out by the supplier before commissioning at site and compare this result with the results, obtained before dispatching the transformer and submit the report along with the above results in CDs for future analysis. Each transformer is subjected to FRA test and frequency responses, recorded as above and analysed in any of the following:-

i. Shift in the response of the winding.
ii. Differences between the responses of all the phases of the transformer.

z) **Dew point measurement test before dispatching**:-

Positive Gas pressure is generally maintained at 0.175 Kg/m² during transportation and during storage. To ensure the same, dew point measurement shall also be carried out at site. The procedure and acceptance limits are as per CBIP Manual Pub. No.295 (2006) or latest.

Besides the above, the OLTC manufacturer shall conduct the following routine tests fully in compliance with IEC: 60214 on every unit, as given below, for which no extra cost will be payable by OHPC.OHPC will authorize its representative(s) for witnessing the said routine tests on any or some or all the OLTCs for the Transformers as per contract. It is the responsibility of the supplier to offer the OLTCs for following routine tests, to be conducted at the works of OLTC Manufacturer.

Sl. No.	IEC reference	Test Description	Acceptance level
1	60214 l. No.5.3.1	Mechanical Endurance Test	Minimum 1000 operations
2	60214 Cl. No.5.3.2	Sequence Test	Switching operation with timing less than 50 m-secs.
3	60214 Cl. No.5.3.4	Pressure Test	10PSI (0.7kg/sq.cm.) for 8hours at room Temperature.
4	60214 Cl. No.5.3.4	Vacuum Test	Vacuum level, as guaranteed by manufacturer.
5	Special Test	Gas tightness Test,	Helium based or any other mutually agreed method.
6	60214 Cl. No.5.3.4	Auxiliary Circuits Insulation earth Test	Should withstand 2kV relative to for 1 Minute.
7	Special Test	Contact resistance	< 2 milli- Ohms.

8	Special Test	Physical & Dimensional Checks.	As per approved drawing.

All the relevant Test reports shall be submitted for OHPC's approval.

N.B. – The Purchaser reserves the right to have the tests carried out on the transformer(s) at his own cost in an independent Government approved laboratory to ensure that the Transformer complies with the requirements of this Specification.

3) **TESTS ON SITE**:-

The following site tests shall be performed on all units:-

a) General mechanical checks.
b) Core and winding insulation tests (Earth fault check on arrival at site).
c) Ratio and HV magnetisation current tests.
d) Vector group check.
e) Motors - Overload protection tests.
f) Motor pumps and motor/fans - Direction of rotation check for correct flow.
g) Buchholz device tests.
h) Silica gel breather check.
i) Temperature instrument calibration and tests.
j) Operational tests on tap change equipment.
k) Electric strength tests on insulating oil.
l) Bushing tests.
m) Impedance voltage at highest, rated and lowest voltage taps.
n) Zero sequence impedance at rated voltage tap.
o) DC resistance at all voltage taps.
p) Correct operation of all CTs
q) On-load tests.

4.7.5 TEST REPORTS:-

a) Six (6) sets of certified test reports shall be submitted for approval prior to the despatch of the equipment. The equipment shall be despatched only when all the required type and routine tests have been carried out and test reports have been approved by the Purchaser.
b) Each test report shall contain the following information:-
   i. Complete identification, date, including serial number of the transformer.
   ii. Method of application, where applied, duration and interpretation of test results for each test.
c) Four (4) copies of the test reports for the tests carried out on the ancillary apparatus be furnished to the Purchaser for approval prior to despatch.
d) All auxiliary equipments/accessories shall be tested as per the relevant standards for the tests, as mentioned in this Specification. Test Certificates for the same shall be submitted to the Purchaser in four copies for scrutiny and record.

4.7.6 LIST OF TRANSFORMER ACCESSORIES AND TEST CERTIFICATES REQUIRED FOR THEM:-

Before offering for stage inspection of the Transformer, the supplier shall have to furnish the test certificates for the Transformer accessories, as enumerated below, wherever required.

Sl. No.	Accessory	Ref. Standard	Test Certificates required
1	Condenser Bushing	IS-2099	1. Appearance, construction and dimensional check. 2. Test for leakage of internal filling at a pressure of 1.Kg/Cm² for 12h. 3. Insulation resistance measurement with 2 KV megger. 4. Dry power frequency voltage withstand test. 5. Dry power frequency voltage withstand test for test tap insulation. 6. Partial discharge measurement upto 1.5UN/ 1.732KV 7. Measurement of tan delta and capacitance.
2	Bushings.	IS-2099	1. Appearance, construction and dimensional check. 2. Insulation resistance measurement with 2 KV megger. 3. Dry power frequency voltage withstand test.
3	OLTC	IS-8468	1. Oil tightness test for the diverter switch oil chamber at an oil pressure of 0.5 Kg/Cm² at 100 degree C for 1 h. 2. Mechanical operation test. 3. Operation sequence measurement. 4. Insulation resistance measurement using 2 KV Megger. 5. Power frequency voltage withstand test on diverter switch to earth and between even and odd contacts. 6. Power frequency voltage withstand test on tap selector between maximum and minimum taps, between phases and supporting frames, between phases. 7. Operation test of complete tap changer. 8. Operation and dielectric test of driving mechanism.
4	Winding temperature indicator.		1. Calibration test. 2. Dielectric test at 2 KV for one minute. 3. Accuracy test for indication and switch setting scales. 4. Test for adjustability of switch setting. 5. Test for switch rating. 6. Measurement of temperature rise with respect to the heater coil current.
5	Oil temperature indicator.		1. Calibration test. 2. Dielectric test of 2 KV for one minute. 3. Accuracy test for indication and switch setting scales. 4. Test for adjustability of switch setting. 5. Test for switch rating.
6	Pressure Relief Valve.		1. Functional test with compressed air to check bursting, pressure indication, flag operation and switch operation.

			2. Dielectric tests at 2 KV for one minute. 3. Switch contact testing at 5A, 240V AC.
7	Cooling fan.	IS: 2312	1. Insulation resistance measurement. 2. Dielectric test at 2 KV between winding and body for 1 minute. 3. Operation check. 4. Appearance, construction and Dimensional check.
8	Buchholz Relay.	IS-3637	1. Leak test with transformer oil at a pressure of 3 Kg. /Cm² for 30 minutes at ambient temperature for relay casing. 2. Insulation resistance measurement with 500 V Megger. 3. Dielectric test at 2 KV for 1 minute. 4. Elements' test at 1.75 Kg/ Cm² for 15 minute using transformer oil at ambient temperature. 5. Loss of oil and surge test. 6. Gas volume test. 7. Mechanical strength test. 8. Velocity calibration test. 9. Appearance, construction and dimensional check.
9	Oil level Indicators.		1. Test for oil levels. 2. Switch operations for low level alarm. 3. Switch contact test at 5A, 240V, A.C. 4. Dielectric tests at 2 KV for 1 minute. 5. Appearance, construction and dimensional check.
10	Pressed Steel Radiators.		1. Air pressure test at 2 Kg/ Cm² under water for 15 minutes. 2. Appearance, construction and dimensional check.
11	OLTC Control Cubicle/ cooler control cubicle.		1. Appearance, construction and Dimensional check. 2. Electrical operation. 3. Insulation resistance measurement using 500 V megger at ambient temperature. 4. Dielectric test at 2 KV for 1 minute.
12	Current transformer.	IS-2705	1. Appearance, construction and dimensional check. 2. Polarity check. 3. Measurement of insulation resistance. 4. High voltage power frequency test. 5. Determination of ratio error and phase angle of measuring and protection CTS. 6. Determination of turns ratio error for PS Class CTS. 7. Inter-turn insulation withstand test. 8. Excitation current characteristic test. 9. Secondary winding resistance measurement. 10. Knee-point voltage measurement for PS Class CT.

4.7.7 <u>INSPECTION</u>:-

4.7.8.1 <u>GENERAL:</u>-

i. The purchaser shall have access at all times to the works and all other places of manufacture where the transformer is being manufactured and the supplier shall provide all facilities for unrestricted inspection of the supplier's works, raw materials,

manufacture of all the accessories and for conducting necessary tests, as detailed herein.

ii. The supplier shall keep the purchaser informed in advance of the time of starting and of the progress of the manufacture of the equipment in its various stages so that arrangements could be made for inspection.

iii. No material shall be despatched from its point of manufacture unless the material has been satisfactorily inspected and tested.

iv. The acceptance of the equipment shall in no way relieve the supplier of his responsibility for meeting all the requirements of this specification and shall not prevent subsequent rejection of such equipment, if found to be defective later.

4.7.8.2 <u>INSPECTION PROGRAMME</u>:-

a) The supplier shall chalk out a detailed inspection and testing programme for manufacturing activities for the various components. An indicative programme of inspection as envisaged by the purchase is given below. This is not however intended to form a comprehensive programme, as it is supplier's responsibility to draw up and carry out such a programme, duly approved by the Purchaser. Stage inspection on core and winding will be carried out before tanking of core. For this, the supplier shall give at least three weeks notice in advance. **<u>The purchaser reserves the right to carry out the stage inspection, final inspection & testing by a third party.</u>**

b) Additional tests, if required, are deemed to be included in the scope of work.

c) Stages of inspection and purchaser's participation would be defined and tied up at the time of award of contract within 15 days of issue of the Purchase order.

d) The supplier shall arrange all his tests in such a fashion that the inspection and testing shall not exceed 5 (five) days for the above transformer.

e) On site testing, if any discrepancies will occur, the supplier will be asked immediately for its rectification and the supplier shall depute his representative for rectification without any delay.

f) At the time of final inspection, the supplier shall identify each & every item/accessories of the particular Transformer under testing. Unless all items are identified, the manufactures will not be treated as complete. Serial No. of bushings, Tap-changer, WTI, OTI and other details shall be entered into the Test reports to ensure that these items are not being applied to the subsequent Transformer units while testing. Various tests as per the specification shall be performed in the presence of OHPC Engineers or when the inspection waiver has been given, in such a case, the testing as per the specification shall be done at the manufacturers works and same should be confirmed by documentary evidence by way of Test Certificate, which shall be got approved by OHPC.

g) In case, for any reason(s), inspection is not completed or the equipment is not found to be complete with all accessories as per confirmation, given with the inspection call, the purchaser reserves the right to recover the complete cost of deputation of inspection team to the works of the manufacturer.

h) The supplier shall submit the test certificates of the bought-out items and Raw materials at the time of the routine testing of the fully assembled equipments.

i) It may be noted that "No change in any accessory or associated equipment after passing all the tests successfully shall be allowed and if this is subsequently detected, it shall be binding on the supplier to replace with the same item with which the initial tests were conducted at his works, failing which the entire test shall become null &

void. The purchaser at his discretion may consider for rejection of the units, thus supplied. The entire cost for replacement of such rejected units, thus supplied and for repeating acceptance tests shall be borne by the suppliers.

1. **TANK AND CONSERVATOR**:-
   a) Certification of chemical analysis and material test of plates.
   b) Welder's qualification and welding procedure.
   c) Testing of electrodes for quality of base materials and coatings.
   d) Inspection of major weld preparation.
   e) Crack detection of major strength weld seams by dye penetration test.
   f) Measurement of film thickness of:
      i. Oil insoluble varnish.
      ii. Zinc chromate paint.
      iii. Finished coat.
   g) Check correct dimensions between wheels, demonstrate turning of wheels through 90 degree and further dimensional check.
   h) Check for physical properties of materials for lifting lugs, jacking pads etc. All load bearing welds including lifting lug welds shall be subjected to N.D.T.
   i) Leakage test of the conservator.
   j) Certification of all test results.
2. **CORE:**
   a) Sample testing of core material for checking specific loss, bend properties, magnetisation characteristics and thickness.
   b) Check on quality of varnish, if used on the stampings.
      i. Measurement of thickness and hardness of varnish on stamping.
      ii. Solvent resistance test to check that varnish does not react in hot oil.
      iii. Check overall quality of varnish by sampling to ensure uniform shining colour, no bare spot, no over-burnt varnish layer and no bubbles on varnished surface.
   c) Check on the amount of burrs.
   d) Bow-check on stampings.
   e) Check for overlapping of stampings, corners of the sheets are to be apart.
   f) Visual and dimensional check during assembly stage.
   g) Check for interlaminar insulation between core sections, before and after pressing.
   h) Check on completed core for measurement of iron loss, determination of knee point voltage and check for any hot spot by exciting the core so as to induce the designed value of the flux density in the core.
   i) Visual and dimensional checks for straightness and roundness of core, thickness of limbs and suitability of clamps.
   j) High voltage test (2 KV for one minute) between core, its bolts and clamps.
   k) Certification of all test result.
3. **INSULATING MATERIAL**
   a) Sampling check for physical properties of materials.
   b) Check for dielectric strength.
   c) Visual and dimensional check.
   d) Check for the reaction of hot oil on insulating materials.
   e) Dimensional stability test at high temperature for insulating material.
   f) Tracking resistance test on insulating materials.
   g) Certification of all tests results.

4. **WINDING**:
   a) Sample check on winding conductor for mechanical properties and electrical conductivity.
   b) Check insulating distance between high voltage connection, cables and earth and other live parts.
   c) Check insulating distance between low voltage connection and earth and other parts.
   d) Check for proper cleanliness and absence of dust.
   e) Visual dimensional checks on conductor for scratches, dent marks etc.
   f) Sample check on insulating paper for PH value, electric strength.
   g) Check for the bonding of insulating paper on the conductor.
   h) Check for absence of short circuit between parallel strands.
   i) Check for brazed joints wherever applicable.
   j) Measurement of voltage ratio to be carried out when core/yoke is completely restacked and all connections are ready.
   k) Certification of all test results.
5. **CHECKS BEFORE DRYING PROCESS**:
   a) Check condition of insulation on the conductor and between the windings.
   b) Check insulating distances between high voltage connections, cables and earth and other live parts.
   c) Check insulating distances between the low voltage connection and earth and other parts.
   d) Insulation test of core earthing. Insulation of the core shall be tested at 2 KV/min. between core to clamp plates and core bolts.
   e) Check for proper cleanliness and absence of dust etc.
   f) Certification of all test results.
6. **CHECKS DURING DRYING PROCESS**:
   a) Measurement and recording of temperature, vacuum and drying time during vacuum treatment.
   b) Check for completeness of drying by measuring IR value and TAN DELTA.
   c) Certification of all test results.
7. **ASSEMBLED TRANSFORMER**:
   a) Check completed transformer against approved out line drawings, provision for all fittings finish level etc.
   b) Jack test with oil on the assembled transformers.
   c) DP test shall be carried out after jacking test.
8. **OIL**:
   Site test shall be performed on oil samples before and after filling in the transformer. Oil parameters shall conform to relevant IEC & IS prior to filling at site and oil samples taken from the tank top, bottom and cooling system after filing shall possess characteristics as per above standards. The supplier shall warrant that oil furnished is in accordance with the relevant clause of this specification. The purchaser at his discretion may send oil sample(s) to Govt. approved laboratory for determination of quality of oil including confirmation on percentages of naphthenic and paraffinic content, as specified at Cl. No.5.4.17 (a) of this Specification.
9. The makes of all major bought out items shall be subject to purchaser's approval. The supplier shall also prepare comprehensive inspection and testing programme for all

bought-out/sub-contracted items and shall submit the same to the purchaser for approval. Such programme shall include the following components.

a) Buchholz Relay
b) Axles and wheels.
c) Winding temperature indicators for local and remote mounting.
d) Oil temperature indicators.
e) Bushings.
f) Neutral current transformers.
g) Cooler control cabinet.
h) Cooling equipments.
i) Fans/Air blowers.
j) Tap changing switch.
k) Terminal connectors.
l) Transformer oil

4.7.8.3 PRE-SHIPMENT CHECK AT SUPPLIER'S WORKS:

a) Check for proper packing and preservation of accessories like radiators, Bushings, explosion vent, dehydrating breather, rollers, Buchholz relay, fans, control cubicle, connecting pipes, conservator etc.
b) Check for proper provision of bracing to arrest the movement of core and winding assembly inside the tank.
c) Gas tightness test to conform tightness.
d) Deviation of leakage rate and ensure adequate reserve gas capacity.

4.7.8.4 RECOMMENDED COMMISSIONING CHECKS:

a) Check the colour of silica gel breather.
b) Check the oil level in the breather housing, conservator tanks, cooling system, condenser bushing etc.
c) Check the bushing for conformity of connection to the lines etc. and tan delta test for bushings at 10 KV (min.)
d) Check for correct operation of all protection and alarm.
   i. Buchholz Relay.
   ii. Excessive winding temperature.
   iii. Excessive oil temperature.
   iv. Low oil flow.
   v. Low oil level indication.
   vi. Fan and pump failure protection.
e) Check for the adequate protection of the electric circuit supplying the accessories.
f) Check resistance of all windings on all the taps.
g) Insulation resistance measurement of:
   i. Control wiring.
   ii. Tap changer motor and control.
   iii. Cooling system motor and control.
   iv. Main windings.
h) Check for cleanliness of the transformer and the surroundings.
i) Continuously observe the transformer operation at no load for 24 hours.
j) Gradually put the transformer on load, check and measure increase in temperature in relation to the load and check the operation with respect to temperature rise, noise level etc.

k) Phase sequence and vector group test.
l) Ratio tests on all taps.
m) Magnetising current test.
n) Tan delta measurement of windings.

4.7.8 <u>QUALITY ASSURANCE PLAN:</u>

The Bidder shall invariably furnish following information alongwith his offer, failing which the offer shall be liable for rejection.

i. Statement giving list of important raw materials, names of Sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw material in presence of Bidder's representative, copies of test certification.

ii. Information and copies of test certificates as in (i) above in respect of bought out items.

iii. List of manufacturing facilities available.

iv. Level of automation achieved and list of areas where manual processing exists.

v. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspection.

vi. Special features provided in the equipment to make it maintenance free.

vii. List of testing equipments available with the Bidder for final testing of equipment specified and test plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly brought out in 'Schedule of Deviations'.

1. The supplier shall within 30 days of placement of order, submit the following information to the purchaser.
   i. Name of the raw materials as well as bought- out accessories and the names of sub-suppliers selected from those furnished along-with the offer.
   ii. Type test certificates of the raw material and bought out accessories.
   iii. Quality Assurance Plan (QAP) with hold points for purchaser's inspection. The QAP and hold points shall be discussed between the purchaser and the supplier before the QAP is finalised. The QAP shall include all the quality checks as stipulated in this specification.
2. The supplier shall submit the routine test certificates of bought out items and raw material at the time of routine testing of the fully assembled transformer.

4.7.9 <u>DOCUMENTATION</u>:

4.7.10.1 All drawings shall conform to relevant International Standards Organisation (ISO) specification. All drawing shall be in ink and suitable for micro filming. All dimensions and data shall be in S.I. Units. **All the drawings are to be submitted in AutoCAD format in addition to hard copy in PDF format.**

4.7.10.2 The Bidder shall furnish along-with the bid dimensional drawings of transformer and all other accessories. These drawing shall include the following information.

a) Dimensions.
b) Tolerances on dimensions.
c) Material designation used for different components with reference to standards.
d) Fabrication details such as welds, finishes and coatings.
e) Catalogue or part members for each component and the total assembly with bill of materials.
f) Identification marking.

g) Weight of individual components and total assembled weight.

4.7.10.3

a) The supplier shall, within 30 (thirty) days of placement of order submit one set of all the following drawings/ documents for purchaser's approval. All Drawings and Designs in complete shape (not in a piece-meal manner) as per the specification and without any deviation should be submitted within 15 (Fifteen) days of placement of Purchase Order.
b) Out line dimensional drawings of transformer and accessories.
c) Table of fittings for OGA.
d) Combined Rating and Diagram plate.
e) OIP HV Bushing.
f) LV Bushing.
g) Neutral Bushings.
h) Twin Bi-directional Roller.
i) Valve schedule plate
j) Foundation plan along with weights of foundations.
k) Oil filling Instruction plate.
l) Schematic control and wiring diagram for all auxiliary equipments including OLTC, cooler, control etc.
m) GA of Marshalling Kiosk.
n) General Arrangement of RTCC panel.
o) Assembly of core with details of stacks dimensions and weights etc.
p) Details of winding arrangement, conductor cross-section & weights etc.
q) CT rating plate.
r) Schematic diagram showing the flow of oil in the cooling system as well as each limb and winding Longitudinal and cross-sectional view showing the duct sizes, cooling pipes etc. for the transformer/ heat exchanger, drawn to scale shall be furnished.
s) Inter connection-cabling diagram between transformer and all panels.
t) Constructional details and sectional views of on-Load Tap Changer.
u) Complete bill of materials.
v) Detailed dimensions, assembly and description of auxiliaries.
w) Constructional details of tank including material, dimensions thickness, reinforcing members, used, if any.
x) Galvanising and painting procedure.
y) Factory Test procedures, lay-out of testing equipments/circuits and Test schedules for tests.
z) Commissioning test procedure and report.
aa) Operation and Maintenance Manual.
bb) QAP during manufacturing and during erection of the transformer.
cc) Any other drawings(s) as required by the purchaser.

The purchaser shall communicate his comments/ approval on the drawings/documents to the supplier within reasonable period. The supplier shall, if necessary, modify the drawings and resubmit four copies of the modified drawings for purchaser's approval within one week from the date of comments. After receipt of purchaser's approval the bidder shall, within one week, submit 15 prints and one good quality reproducible of the approved drawings for purchaser's use.

1. **DESIGN REVIEW:-**

2.1 The Transformers shall be designed, manufactured and tested in accordance with the best International Engineering Practices under strict Quality Control to meet the requirements, stipulated in the Technical specification. Adequate safety margin with respect to thermal, mechanical, di-electric, electrical stresses and electrical clearances shall be maintained during design, selection of raw materials, manufacturing process etc. so that the Transformer provides long life with least maintenance.

2.2 The design review will commence after placement of award with successful Bidder and shall be finalized before final drawing approval. The supplier shall depute their design engineer(s) to OHPC for design review and finalisation of drawings. However, the entire responsibility of design shall rest with the manufacturer.

2.3 The representative of the purchaser may visit to the manufacturer's works to inspect design, manufacturing and testing facilities.

2.4 **The design review shall be conducted generally following the "Guidelines for conducting design reviews, prepared by CIGRE SC12 working Group 12.22 and as per Appendix-VI (Design Review parameters) of CBIP Publication No – 317.**

2.5 The manufacturer shall provide all necessary information and calculations during design review to demonstrate that the Transformer meets the requirements for short circuit strength and durability. The latest recommendations of IEC and CIGRE SC12 shall be applied for short circuit withstand evaluation.

2.6 The manufacturer will be required to demonstrate the use of adequate safety margin for thermal, mechanical, dielectric and vibration etc. to take into account the uncertainties of his design and manufacturing processes.

2.7 The scope of such a design review shall at least include the followings:-

i. Core design
ii. Winding, tapping and Insulation design
iii. Short-circuit withstand capability
iv. Electrical clearances between windings to core(both axially and radially) between windings, outer windings to tank etc.
v. Thermal design including areas, prone to hot spots including thermal modeling for placement of the Optic Fiber Temperature Sensors.
vi. Cooler design
vii. Over-load capacity
viii. Over-fluxing
ix. Magnetising Inrush current
x. Eddy current losses
xi. Seismic design
xii. Insulation co-ordination
xiii. Tank &Accessories
xiv. Bushings & barrier design
xv. Tap-changer
xvi. Protective devices
xvii. Fans & radiators
xviii. Oil & oil preservation system
xix. Corrosion protection
xx. Electrical and physical interfaces with sub-station

xxi. Earthing
xxii. Processing and assembly
xxiii. Testing capabilities
xxiv. Inspection and Test plan
xxv. Transport and storage
xxvi. Sensitivity of design to specified parameters
xxvii. Accoustic noise
xxviii. Spares, inter-changeability and standardization
xxix. Maintainability
xxx. Any other design aspect, as deemed necessary

4.7.10.4 The supplier shall also furnish five copies of bound manuals for each transformer covering erection, commissioning, operation and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices. Marked erection drawings shall identify the component parts of the equipment as shipped to enable purchaser to carry out erection with his own personnel. Each manual shall also contain one set of all the approved drawings, type test reports as well as acceptance reports of the corresponding consignment despatched.

4.7.10.5 The manufacturing of the equipment shall be strictly in accordance with this Specification, approved drawings and no deviation shall be permitted without the written approval of the purchaser. All manufacturing and fabrication work in connection the equipment prior to the approval of the drawings shall be at the supplier's risk.

However, approval of the drawings by the purchaser shall not relieve the supplier of his responsibility and liability for ensuring correctness and correct interpretation of the latest revision of applicable standards, rules and codes of practices. The Transformer shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering and the purchaser shall have the power to reject any material, which in his judgement is not in full accordance therewith.

1. **TEST REPORTS:**
   - **i.** Four copies of type test reports shall be furnished to the purchaser. One copy will be returned duly certified by the purchaser to the supplier.
   - **ii.** Four copies of routine test reports shall be furnished to the purchaser. One copy will be returned duly certified by the purchaser and only thereafter shall the materials be despatched.
   - **iii.** All records of routine test reports shall be maintained by the supplier at his works for periodic inspection by the purchaser.
   - **iv.** All test reports for tests conducted during manufacture shall be maintained by the supplier. These shall be produced for verification as and when requested for by the purchaser.

4.7.10 TRANSPORTATION, PACKING AND FORWARDING:-

1) The supplier shall dispatch the transformer, filled with oil or in an atmosphere of nitrogen or dry air at positive pressure. In the former case, the supplier shall take care of the weight limitation on transport and handling facility at site. In the latter case, necessary arrangement shall be ensured by the supplier to take care of pressure drop of nitrogen or dry air during transit and at site of installation. The nitrogen or dry air

cylinder, provided to maintain positive pressure can be taken back by the supplier after oil filling. A gas pressure-testing valve with necessary pressure gauge and adapter valve shall be provided. **Transformer shall also be fitted with at least one "Electronic Impact Recorder" (on returnable basis) during transportation to measure the magnitude and duration of the impact in all three directions. The acceptance criteria and limits of impact in all three directions, which can be withstood by the equipment during transportation and handling, shall be submitted by the supplier during detailed engineering. The recording shall commence in the factory before dispatch and must continue till the unit is received/installed at destination sub-station. The data of electronic impact recorder(s) shall be downloaded at site and a soft copy of it shall be handed over to Engineer-in-charge. Further, within three weeks, the supplier shall communicate the interpretation of the data.**

2) The equipment shall be suitable for vertical/horizontal transport as the case may be and suitable to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate handling during transfer, loading and unloading. The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Whenever necessary, proper arrangement for lifting, such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by supplier without any extra cost.

3) Each consignment shall be accompanied by a detailed packing list containing the following information:-

a) Name of the consignee.
b) Details of consignment.
c) Destination.
d) Total weight of consignment.
e) Sign showing upper/lower side of the crate.
f) Handling and unpacking instructions.
g) Bill of materials indicating contents of each package.
h) Two sets of approved copies of drawings, instruction and commissioning manuals, approved test certificates and certificates of bought out items, approved copies of guarantee certificate.

4) The supplier shall ensure that the packing and bill of materials are approved by the purchaser before despatch.

4.7.11 <u>ERECTION, TESTING AND COMMISSIONING (ETC)</u>:

The **Erection, Testing & Commissioning** of the transformer shall be supervised by trained personnel (Engineer) of the supplier. The Engineer shall direct the sequence of ETC. The Engineer shall correct in the field, any errors or omissions on the part of the supplier, in order to make the equipment and material properly perform in accordance with the intent of this specification. The Engineer shall also instruct the plant operators in the operation and maintenance of the commissioned equipment. The supplier shall be responsible for any damage to the equipment, on commissioning the same, if such damage results from faulty or improper ETC procedure. Purchaser shall provide adequate number of skilled/semi-skilled workers as well as all ordinary tools and equipment and cranes required for equipment erection, at his own expenses. Apart from the above, the purchaser shall not be responsible for any other expenses such as Engineer's salary, insurance against personal injuries to the Engineer

etc. Special tools, if required for erection and commissioning, shall be arranged by the supplier at his cost and on commissioning, these shall be supplied to the purchaser, free of cost for future use. The **Erection, Testing & Commissioning** charges will be borne by the Purchaser as per tender price schedule.

4.7.12 QUANTITY AND DELIVERY REQUIREMENTS:

i. The firm will submit a 'PERT CHART', indicating the manufacturing, inspection, testing and delivery schedule in details immediately after receipt of the Purchase Order.

ii. The scope of supply shall also include supply of 2.5% extra quantity of bolts, nuts, washers, split pins, cotter pins and such other small loose items, free of cost in addition to the materials/equipments as spelt out in this specification.

4.7.13 Values quoted in the G.T.P. and in details of loss calculations shall not differ. In case if it differs, then values quoted in the G.T.P. will be taken as final for all purposes.

4.7.14 METHOD OF TECHNICAL EVALUATION:

Bids will be evaluated in the following manner.

a) To check the flux density at the rated voltage i.e., 220KV/33KV rated frequency i.e., 50 Hz and maximum stacking factor as 0.97.

b) To check the data furnished in the GTP as correct as per the Technical Specification. If on calculation, GTP data will be different from the calculated data, then the bid will not be considered or owner may take any other decision. GTP furnished in incomplete shape will not be considered for evaluation.

c) If HI-B grade sheet steel for core material has not been quoted and specific loss and B-H curve for the said material alongwith the materials name and test report has not been furnished, the bid will be rejected. Details of HIB core particulars like length, Breadth, thickness of each stack alongwith core dia., L.V., & H.V. No of turns and lamination thickness, weight of core shall be submitted alongwith the bid failing which tender will be liable for rejection.

d) Bid will be rejected, if firm will not accept all the specified Technical terms and conditions.

e) Bid will be rejected if Maximum Flux Density and Core weight calculation (As per Annex-II) and details of Loss calculations (As per Annex-III) will not be found to be in order and if there is any ambiguity/discrepancy, noticed in the above calculations.

f) The Bidder shall submit alongwith the bid the graph depicting the saturation characteristic curve between the no load voltage (RMS) vs.-measured excitation current starting from 10% of rated no load voltage to 125% of the same, failing which the tender is liable for rejection. The knee point voltage shall have to satisfy the specified value as per the criteria stipulated at Clause No.4 (18) of this Specification.

Bidders are required to be careful in choosing the maximum flux density, best possible core materials (HIB or better) and type of corner joints of the core etc.so as to quote the practicable no-load current at different percentages of rated no-load voltage as per given GTP format and submit a linear graph along with the tender, confirming to achieve the specified minimum knee point voltage i.e. 110% of the rated voltage during no-load test as per the method, stipulated at CL.No.6.4.2 (k) of this Technical Specification, which will be confirmed through testing both during stage inspection and final inspection.

4.8 FITTINGS AND ACCESSORIES: All required fitting and accessories, shall be supplied with each Transformer. Any fitting, required essential other than those listed below shall also be supplied along with each Transformer without any extra cost to the purchaser.

4.9 QUALITY ASSURANCE PLAN:

The Bidder shall invariably furnish following information along with his offer.

i) Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards, according to which the raw materials are tested, list of tests, normally carried out on raw materials in presence of Bidder's representative, copies of test certificates.
ii) Information and copies of test certificates as in (i) above in respect of bought out items.
iii) List of manufacturing facilities available.
iv) Level of automation achieved and list of areas where manual processing exists.
v) List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of such tests and inspection.
vi) Special features provided in the equipment to make it maintenance free.
vii) List of testing equipments, meters and test plant limitation, if any, vis-a-vis the type, acceptance and routine tests, specified in the relevant standards. These limitations shall be very clearly brought out in the offer.
viii) All the testing equipments, meters etc. should have been calibrated in a Government approved laboratory.
ix) The supplier shall submit the routine test certificates of bought out items and raw materials at the time of acceptance testing of the fully assembled equipment.

4.10 DOCUMENT: (DRAWING AND LITERATURE):

The successful tenderer shall furnish all necessary drawings as listed below in triplicate.

(A) The supplier shall submit to the purchaser, general assembly drawings of the equipment to be supplied and sufficient sub-assembly drawings showing in details the sizes and location of all parts of the equipment including connections. All drawing shall be in English and dimension given in Metric Units. **Six copies** of these drawings shall be sent to the purchaser, **one of which shall be soft copy**. The supplier shall be responsible for any alternation of works done due to any discrepancies, errors and omission in drawings supplied or other particulars supplied by him whether such drawings and **particulars have been approved by the purchaser or not without any extra cost**.

(B) If required by the purchaser, the supplier shall supply additional copies of drawings, other than shop drawings, which may be needed in connection with the contract.

(C) All information should be in ENGLISH LANGUAGE.

4.11 TEST REPORTS:

i) Four copies of type test / special test reports shall be furnished to the Purchaser.
ii) Copies of acceptance test reports and routine test reports shall be furnished to the Purchaser.
iii) All records of routine test reports shall be maintained by the supplier at his works for periodic inspection by the Purchaser.
iv) All test reports of tests, conducted during manufacturing shall be maintained by the supplier. These shall be produced for verification as and when required for by the purchaser.

4.12 PACKING AND FORWARDING:

The equipment shall be packed in suitable crates so as to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement for lifting such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by supplier without any extra cost.

Each consignment shall be accompanied by a detailed packing list containing the following information:

i. Name of the consignee.
ii. Details of consignment.
iii. Destination.
iv. Total weight of consignment.
v. Sign showing upper, lower side of the crate.
vi. Handling and unpacking instructions.
vii. Bill of materials indicating contents of each package.
viii. Set of drawings if applicable.

4.12 COMPLETENESS OF EQUIPMENT: All Plant & Equipment supplied under the specification shall be fully complete in all respect whether such details are mentioned in these specifications or not. Any fittings, accessories or apparatus not mentioned in the specification but are necessary for the equipment shall be deemed to have been included in the specification.

4.13 ERECTION, TESTING & COMMISSIONING:

i) Erection, Testing and Commissioning of the transformer shall be completed **in presence of the authorised service engineer** of the manufacturer **within 45 days** from the date of **handing over of site by the EIC** for erection, testing and commissioning.

ii) The permission for carrying out erection, testing & commissioning by the firm will be issued by OHPC for the Transformer.

iii) Date of issue of permission will be intimated to the firm **one week in advance**.

iv) For commissioning of transformers, necessary clearance from electrical inspector shall be arranged by the customer. However, the contractor shall extend all cooperation for obtaining clearance from electrical inspector. Time taken for obtaining clearance from Electrical Inspector shall not be counted towards completion period.

4.14 ERECTION, TESTING & COMMISSIONING: - The successful tenderer shall furnish detailed instructions with drawings and leaflets to enable satisfactory erection, testing & commissioning of transformers. Such instructions shall reach the purchaser well in advance so that there is no delay in commencement of erection. **The manufacturer shall depute their authorised service engineer to site for Erection, Testing & Commissioning of the transformer.**

4.15 INSTRUCTION MANUAL: - The supplier shall supply **6 (six) copies** of approved drawings, technical literature/ instruction manual to the purchaser for reference.

4.16 DEVIATION FROM SPECIFICATIONS: - All deviations from the Specification shall be separately listed. Each such deviation shall be properly justified with supporting documents.

4.17 FACILITIES TO BE PROVIDED BY OHPC: OHPC may provide the following facilities on request from the firm for Erection, Testing & Commissioning work.

1) Power supply at work site
2) Accommodation to Erection, Testing & Commissioning personnel depending upon availability on chargeable basis
3) Issue of gate pass to work site

4.18 SITE TESTING & COMMISSIONING: - The firm shall conduct the required tests at site before commissioning as per manufacturers' guidelines and approved relevant Indian standards. After test results are found satisfactory, the commissioning will be carried out.

For commissioning of Transformers, necessary clearance from electrical inspector shall be arranged by the customer. However, the contractor shall extend all cooperation for obtaining clearance from electrical inspector.

ii. DETAILED TECHNICAL SPECIFICATION :

Detail Technical Specification of 220/33 KV, 20 MVA POWER Transformer:

The existing 220/33 KV, 20 MVA Station Service Transformer of GEC Make of UIHEP, Mukhiguda has the following technical parameters.

Sl. No.	Item	Specification
1	Type of Power Transformer / Installation	3 Phase, 20 MVA Power Transformer, Outdoor type oil immersed transformer suitable for bi-directional power flow.
	Voltage Rating (LV / HV): (a) Maximum system voltage (b) Nominal voltage Ratio (HV/LV)	 245 KV/36KV ratio (HV/LV) 220 KV/33 KV ratio (HV/LV)
2	Mounting Type	On wheels, mounted on rails.
3	Suitable for system frequency	50 Hz ±5%
4	No. of phases	Three (3)
5	No. of windings	Two
6	a) Type of cooling	a) ONAN/ONAF
	b) MVA Rating corresponding to cooling system: **(i) ONAN cooling** **(ii) ONAF cooling**	 20 MVA **75% -** 15MVA **100%-** 20 MVA
7	Continuous Maximum Rating (CMR)	20 MVA
8	Method of connection	HV-Star with Neutral Grounded LV- Star with Neutral Grounded
9	Connection Symbol (Vector group)	YNyn0
10	System Earthing:	Effectively solidly earthed (Neutral of both HV & LV). The neutral terminal shall be brought to ground level by earth flat and connected to the purchaser's local earth net.
11	Percentage Impedances at 75^0 C: Impendence Volt HV/ LV %: Tap 1 Tap 13 Tap 17	 8.387 7.703 7.389

12	Anticipated regular cyclic overloading of windings: Anticipated unbalanced loading: Anticipated continuous loading of windings (HV & LV):	as per IEC76-1, Clause 4.2 less than 10% 110% of rated current
13	**Tap changing gear:** **a)** Type **b)** Provided on **c)** **Tap range** **d)** **Tap step** **e)** Automatic control required? **f)** Remote control panel required? **g)** DC supply **h)** Marshalling kiosk required? **i)** Current rating of OLTC **j)** Short circuit current rating of OLTC	**In Tank, Hi-speed Resistor Type** **a)** On load **b)** HV side **c)** **+15% to -5%** **d)** **1.25% of 220KV** **e)** Yes **f)** Yes **g)** Yes **h)** Yes **i)** 350A (Min.) **j)** 6 KA (Min.)
14	Over voltage operating capability and duration	125% rated voltage for 60 sec. 140% rated voltage for 5 sec. 110% rated voltage continuous
15	Minimum Air core reactance of HV	20%
16	Direction of normal power flow	HV to LV
17	Minimum knee point voltage	110% of rated voltage
18	Maximum Flux Density in any part of the core and yoke at rated MVA, Maximum System voltage [245 KV/36 KV] and minimum system frequency [48.5 HZ] [In Tesla].	1.6 web/m2 (Tesla)
19	Type of winding insulation:	HV winding – Graded LV winding – Full

20	**a)** Withstand time for three phase short circuit at Terminals. **b)** System short circuit level and duration for which the transformer shall be capable to withstand thermal and dynamic stresses (kA rms/sec.) **c) Dynamic Short circuit tests requirement & validity:**	**a)** 5 seconds **b)** For 11 kV system: 25 kA for 5 sec. For 220 kV System: 40 kA for 5 sec. **c) The design of the transformer which is similar to the offered transformer should have been tested for short circuit withstand capability as per IS 2026 Part-5 within last 5 years. The relevant test report/ certificate shall be enclosed along with the bid. Further, design review of the offered transformer shall be carried out based on the design of reference transformer which has already been subjected to short circuit tests in lieu of repetition of short circuit tests. In case, manufacturer has not conducted short circuit tests earlier, the same shall be carried out based on the offered transformer.**

21	Maximum partial discharge level	As per relevant up-to-date IEC
22	Noise level at rated voltage and frequency (Maximum)	As specified in NEMA-TR-1
23	Permissible temperature rise over ambient temp of 50 deg C. Top oil measured by thermometer Winding temperature measured by resistance	 40 deg C 45 deg C
24	Minimum clearance in Air (mm) (Bushing Insulator & Terminals) Minimum clearances in air (mm)	Phase to Phase / Phase to ground HV: 2350 / 2150 LV: 400 / 320 HV to LV: 2200 / -
25	Terminal Bushing: **a)** HV-RIP / RIS type with polymer housing **b)** LV-OIP / solid porcelain type with porcelain / polymer housing **c)** HV-Neutral Voltage Current **d)** LV-Neutral Voltage Current	Voltage, / Current 245 KV, / 1250 Amps 36 KV, / 1000Amps 52 KV (N), / 1000Amps 36 KV(N), / 1000 Amps

26	Maximum Radio Interference voltage level at 1MHz & 1.1 times maximum rms phase to ground voltage for HV winding. Minimum visual corona extinction voltage. (kV rms)	As per IS/relevant standard As per IS/ relevant standard
27	Cooling equipment /Method	ONAN/ONAF
	(a) Number of cooler banks required	Minimum of two
	(b) Rating of each bank as % of total loss	Not greater than 50%.
	(c) No. of Fans.	Adequate number of fans of 18"/24" sweep with one no. of stand-by fan in each bank.
28	**Insulation level of bushing:** a) Lightning Impulse withstand voltage (KVP) b) 1 Minute Power Frequency withstand Voltage (KV - rms) c) Creepage distance (mm). (min.) d) Maximum Tan Delta for bushings at ambient Temp. (Tan delta shall be measured at ambient temperature. No temperature correction factor shall be applied).	**HV** **LV** **LVN** **HVN** 1050 170 170 250 505 70 70 105 6125 900 900 1300 < 0.004
29	Material of HV & LV Conductor	Copper
30	Protective Current transformers to be supplied at line terminals. H.V L.V	 Yes. Yes.
31	Protective C.T to be supplied at Neutral (H.V & LV)	Yes.

Details of Current Transformer							
	RATIO	**ACCU. CLASS**	**BURDEN (VA)**	**Knee Point Voltage**	**Max. Sec. Res. 75° C (OHMS)**	**Imag at $V_{k/2}$ (mA)**	**PURPOSE**
HV: 1 UCT 1 VCT 1 WCT	**50/1**	**PS**	**--**	**>64**	**2**	**≯30**	**REF PROTECTION**
1 NCT OUTDOOR	**50/1**	**PS**	**--**	**>64**	**2**	**≯30**	**REF PROTECTION**
LV: 2 UCT 2 2 VCT 2 2 WCT 2	**350/1.75**	**5**	**10**	**--**	**--**	**--**	**WINDING TEMPERTAURE**
2 UCT 1	**300/1/1**	**PS**	**10**	**>300**	**2**	**≯30**	**REF PROTECTION & OVER CURRENT**
2 VCT 1		**5P10**	**30**	**--**	**--**		
2 WCT 1							
2 NCT	**300/1**	**PS**	**--**	**>300**	**2**	**≯30**	**REF PROTECTION**

32	**(a)** Maximum current density for HV & LV windings for rated current **(b)** Maximum Tan Delta for winding at ambient Temp. (Tan delta shall be measured at ambient temperature. No temperature correction factor shall be applied)	2.8 Amp/mm² < 0.005
33	Type of Oil Preservation	Air cell type
34	**(i)** Minimum Insulation resistance at an ambient Temperature of 30 deg. C with 5KV Megger for 600 seconds duration. **(ii)** Polarisation index i.e. ratio of IR values at 600 sec. to 60 sec. for H.V. to Earth, L.V. to Earth and H.V to L.V **(iii)** Zero Sequence Impedance **(iv)** Core Assembly **(v)** No of pressure relieve device to be provided	HV / E & LV / E - 3000 M-ohms HV / LV - 4000 M-ohms Shall be greater than equal to 2 and less than 5 as per clause No-7.2.13.4 IEEE Standard C57.152-2013 Shall be 80% or more of the positive sequence value BOLTLESS TYPE Adequate
35	Are arching horns required? HV & LV bushings	Yes
36	Is Temp. Test is required?	Yes
37	Alarm control indicating and protective devices required a) Winding temp indicator (for both HV &LV) b) Winding Temp alarm contacts c) Winding temp trip contacts d) Oil temp indicator e) Oil temp alarm contacts f) Oil temp trip contacts g) Buchholz alarm contacts h) Buchholz trip contacts	 Yes Yes Yes Yes Yes Yes Yes Yes

Any tender without complete information as asked for in the above Specification is likely to be rejected.

Signature of the Tenderer

(With Seal)

SECTION – V

ANNEXURE–1

NO RELATION CERTIFICATE

THIS IS TO CERTIFY THAT I HAVE NO RELATIONSHIP WITH ANY EMPLOYEE SERVING UNDER OHPC LTD., ODISHA. IN CASE THE ABOVE STATEMENT IS FOUND TO BE FALSE, I MAY BE DEBARRED FROM ANY PAYMENT DUE ON ACCOUNT OF THIS CONTRACT.

SIGNATURE OF THE TENDERS

Place:

ANNEXURE – 2

(This Proforma should be filled in with all information and should be furnished with tender)

1	Name and detail address of the Manufacturer/ Manufacturer's channel partner:	
2	Mobile No. & Email ID of the Bidder:	
3	Cost of Tender Paper furnished; a) BC/DD (details to be mentioned)	Yes / No
4	Bid Security Declaration Form furnished	Yes / No
5	Validity 180 days:	Yes / No
6	Price Basis-F.O.R. Destination (Central Store / Power House, UIHEP, Mukhiguda)	Yes / No
7	Packing & Forwarding, Freight and Insurance, loading & un-loading Charges included in price:	Yes / No
8	Rate of GST mentioned with HSN Code No:	Yes / No
9	Nature of Prices; as in the condition	Yes / No
10	Terms of Payment (Agreeable to terms of payment as mentioned in tender specification)	Yes / No
11	Delivery Period **09 Months from date of issue of approved Drawings**	Yes / No
12	Penalty:- Whether agreeable to OHPCL 's terms or not	Yes / No
13	Audited Balance sheet & profit loss accounts of the bidder for past3(three) years	Yes / No
14	Guarantee – Whether agreeable to OHPC terms	Yes / No
15	Whether agreeable to furnish Composite Bank Guarantee towards Advance Payment	Yes / No
16	Whether agreeable to furnish Composite Bank Guarantee on award of P.O. for security of performance	Yes / No
17	Whether copy of earlier order/supply to reputed customers attached:	Yes / No
18	Whether type test certificates from any Government approved Laboratory is furnished or not	Yes / No
19	Whether guaranteed technical particulars are furnished or not	Yes / No
20	Whether dimensional design/drawings furnished or not	Yes / No
21	Whether materials are ISI/ISO marked	Yes / No
22	Whether registered under GST Act	Yes / No
23	Whether declaration form, duly filled in, furnished or not	Yes / No
24	Whether loss calculation of transformer, furnished or not	Yes / No
25	Whether furnished other Annexures	Yes / No
26	Whether agreed to all other terms and conditions of the specification:	Yes / No

SIGNATURE OF THE TENDERER
NAME:
DESIGNATION (SEAL):

ANNEXURE – 3

A F F I D A V I T

(To be sworn before the Notary)

I/We, _____ (Name of the bidder) a Company / firm incorporated under the provisions of the Indian Companies Act / Proprietorship / Firm registered under Indian Partnership act. / Sole Proprietor having its Registered office / Corporate Office / at _____ and represented through Sh _____ duly authorized person (_____ Designation) hereby solemnly declare & affirm as under: -

1. That we, _____ (Name of the bidder) have not been blacklisted / debarred / disqualified by any Govt. or any of its agencies or PSUs etc. last three years upto the date of submission of the bid.

DEPONENT

Place:

Date:

VERIFICATION

I/We, _____ (Name of the bidder), the above named deponent, do hereby verify that the contents of Paragraph – 1 of this affidavit is true to by personal knowledge and nothing has been concealed and no part of it is false.

Verified at _____ this _____ day of _____

DEPONENT

With seal

ANNEXURE – 4

(Manufacturer's Authorization Form)

(Should be printed on Manufacturer's letter head only)

To

The Unit Head,
UIHEP, Mukhiguda, OHPC Ltd.
District: Kalahandi, Pin-766026, Odisha.

We _____, manufacturers of equipment for "TRANSFORMERS" having production facilities at _____, do hereby authorize _____ to submit a bid and subsequently sign the Contract, if they become successful against "Tender Call Notice _____ for "**DESIGN, MANUFACTURING, SUPPLY, ERECTION (INCLUDING UNLOADING & DRAGGING), TESTING & COMMISSIONING OF 01 NO. OF NEW 20 MVA, 220/33 KV POWER TRANSFORMER FOR UIHEP, MUKHIGUDA**".

We hereby extend our full guarantee, warranty and latent defects liability period for the above specified Material/ Equipment offered by the bidder, _____ against the above Tender Specification. We also hereby authorize the said bidder to act on our behalf in fulfilment of these guarantee, warranty and latent defects liability obligation. We, the Manufacturer will make our technical and engineering staff fully available to the successful Bidder, on a reasonable and best effort basis, in fulfilling the performance of all its obligations to OHPC, Upper Indravati Project under the Contract.

For;

Name:

Signature with Seal:

Place: **Date:**

ANNEXURE -5

(DECLARATION FORM)

To,

The Unit Head
UIHEP, Mukhiguda, OHPC Ltd.

Sir,

1. Having examined the above specification together with terms & conditions referred to therein *I/We the undersigned hereby offer to supply the materials /equipment covered here in complete in all respects as per the specification and General conditions, at the rates, entered in the attached contract schedule of prices in the Tender.
2. * I/We hereby undertake to have the materials/equipment delivered within the time specified in the Tender.
3. * I/We hereby guarantee the technical particulars given in the Tender supported with necessary reports from concerned authorities.
4. In the event of Tender, being decided in *my/our favour, * I/We agree to furnish the Security Deposit in the manner, acceptable to Odisha Hydro Power Corporation Ltd., and for the sum as applicable to *me/us within 21days of acceptance of purchase order failing which *I/We clearly understand that the said letter of Intent/Purchase order will be liable to be withdrawn by the purchaser, and the …….. Signed this day of 20___

Yours

faithfully,

SIGNATURE OF THE TENDERER WITH SEAL &DATE

[This form should be dully filled up by the tenderer and submitted along with the original copy of the tender]

*** (Strike out whichever is not applicable).**

ANNEXURE–6

DEVIATION FROM SPECIFICATION

Tenderer shall enter below particulars of his alternative proposals for deviations from the specification if any.

1. DEVIATION FROM SPECIFICATION (TECHNICAL)

Sl. No.	Clause No of Specification	Particulars of Deviations with sufficient justification

SIGNATURE OF THE TENDERER WITH SEAL & DATE

2. DEVIATION FROM THE CONDITION OF CONTRACT

Please mention below if any deviation from the conditions of the contract as herein.

SIGNATURE OF THE TENDERER WITH SEAL & DATE

ANNEXURE–7

TENDER CALL NOTICE NO. UIHEP-07/ 2025-26 Dated 05.05.2025

CHECK LIST FOR QUALIFYING REQUIREMENTS

1	The bidder has manufacturing and supply experience of the rating, as tendered or higher capacity Transformer (both MVA & *voltage rating) for* a minimum period of 5(Five) years as on the date of opening of Techno-Commercial bid. If Yes, necessary supporting documents/information, furnished	**YES/NO**
2	Nos. of transformers, as tendered or higher capacity (both MVA and voltage rating), supplied during the above period (Whether separate sheet is enclosed, indicating the MVA, voltage rating of HV/LV, purchase order No. &Date, Name of the customer, Date of supply etc.) If Yes, necessary supporting documents/information, furnished or not.	**YES/NO**
3	The rating, as tendered or higher capacity (both MVA and Voltage rating) transformers have at least 3 (Three) years successful performance from the date of commissioning.	**YES/NO**
4	Whether the bidder has adequate infrastructural facility for "after sales service".	**YES/NO**
5	Type test reports of the bidder for the transformer, offered, or higher capacity (both MVA & voltage rating), tests being conducted in Govt. recognized laboratories and not earlier than five years as on the date of opening of bid, furnished.	**YES/NO**

SIGNATURE OF THE TENDERER WITH SEAL & DATE

ANNEXURE–8

TENDER CALL NOTICE NO. UIHEP-07/ 2025-26 Dated 05.05.2025

SELF CERTIFICATION TOWARDS AUTHENTICATION OF DOCUMENTS

THIS IS TO CERTIFY THAT, THE DOCUMENTS SUBMITTED BY ME/US* AGAINST THIS TENDER IS GENUINE & AUTHENTIC. INCASE, THE DOCUMENTS SUBSEQUENTLY PROVED TO BE FALSE, MY/OUR* CONTRACT WILL BE RESCINDED WITH FORFEITURE OF E.M.D AND SECURITY DEPOSIT AND I/WE* SHALL BE DEBARRED FROM ANY PAYMENT DUE ON ACCOUNT OF THIS CONTRACT AND SUITABLE ACTION SHALL BE TAKEN AGAINST ME/US*.

(*) - Strike out which is not applicable

SIGNATURE OF THE TENDERER WITH SEAL & DATE

ANNEXURE–9

(A)

TENDER CALL NOTICE NO. UIHEP-07/ 2025-26 Dated 05.05.2025

PROFORMA FOR COMPOSITE BANK GUARANTEE FOR PAYMENT OF ADVANCE

1. In consideration of Upper Indravati Hydro Electric Project (UIHEP), Mukhiguda, Dist- Kalahandi, Odisha, a unit of Odisha Hydro Power Corporation Limited, a company incorporated under the laws of India and having its registered office at Bhubaneswar, Odisha 751022, India (hereinafter called OHPC) having agreed to exempt, M/s from the demand, under
   The terms and conditions of the Work Order No.……dated… of security deposit for payment of advance on production of Bank Guarantee for Rs.…… (Rupees).

   We……..Bank (herein after referred to as "The Bank")at the request of the said supplier do hereby undertake to pay UIHEP, Mukhiguda, OHPC Ltd. an amount not exceeding Rs.…… (Rupees) against non-fulfilment of the terms and condition of the purchase order / non-execution of the purchase order in due date.
2. We… Bank do hereby undertake to pay the amount due and Payable under this guarantee against non-submission of Bank Guarantee for security deposit for payment of advance as per the terms and conditions of the said purchase order **within 15 days** of the issue of purchase order.
3. We the……. Bank undertake to pay OHPC any money so demanded notwithstanding any disputes raised by the supplier in suit or proceeding pending before any court or tribunal relating thereto, our liability under this present being absolute and un-revocable. This payment so made by us underthisbondshallbeavaliddischargeofourliabilityforpaymentthere under and the supplier shall have no claim against us for making such payment.
4. We the Bank further agree that, the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said contract and that it shall continue to be enforceable till all the dues of OHPC, under or by virtue of the said agreement having been fully paid its claims satisfied or discharge until Unit Head, UIHEP, Mukhiguda, OHPC Ltd. certifies that, the terms and conditions of the said agreement have been fully and properly carried out by the said tenderer and accordingly, discharges this guarantee. Unless a demand claim under this guarantee is made on us in writing on or before the expiry of **One year and 15 days** from the date of issue of the purchase order, we shall be discharged from all liability under this guarantee thereafter.
5. We the Bank further agree with OHPC that OHPC shall have the fullest liberty, without our consent and without affecting in any manner our obligation hereunder, to vary any of the terms and conditions of the said agreement to extend time of performance by the said supplier and to for bear or enforce any of the terms and conditions relating to the said agreement we shall not be relieved from our liability by reasons of any such variation, postponement or extension being granted to the said supplier or by any such matter of thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.
6. This guarantee will not be discharged due to the change in name, style and constitution of the Bank or the suppliers
7. We the ……Bank lastly

undertake not to revoke this guarantee during his currency during this currency except with the previous consent of OHPC in writing.
Dated the……. Day of… 20….

8. We or our Bank at (Name & Address of the local bank) are liable to pay the guaranteed amount depending on the filing of the claim and any part thereof under this Bank Guarantee only and only if you serve upon us or our local bank at written claim or demand and received by us or by local branch at on or before dt… otherwise bank shall be discharged of all liabilities under this guarantee thereafter.

Witness (Name, Signature & Address)

1.

2.

For Bank.

ANNEXURE -9

(B)

BANK GUARANTEE

(Security for Performance)

TENDER CALL NOTICE NO. UIHEP-07/ 2025-26 Dated 05.05.2025

In consideration of the Odisha Hydro Power Corporation Limited, a Company incorporated under the laws of India and having its registered office at Bhubaneswar, Odisha – 751001, India (hereinafter called OHPC) having agreed to exempt M/s ..... (Hereinafter called the "Contractor") from the demand, under the terms and conditions of an agreement No. ..... dated ..... made between and ..... for ..... (Hereinafter called the "agreement"), of security deposit for satisfactory performances of materials and works (as detailed in the agreement) during the guarantee period (as detailed in the agreement) and for the fulfilment by the Contractor(s) of the terms and conditions contained in the said agreement, on production of bank Guarantee for Rs. ..... (Rupees ..... only) against any loss or damage caused to or suffered or would be caused to or suffered by OHPC by reason of any breach by the said Contractor(s) of any terms and conditions contained in the said agreement.

We, ... Bank Limited (hereinafter referred to as "the Bank") at the request of the said Contractor do hereby undertake to pay to OHPC an amount not exceeding ..... against any loss or damage caused to or suffered or would be caused to or suffered by OHPC by reason for any breach by the said contractor of any of the terms and conditions contained in the said contract.

1. We, ... Bank Limited do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on demand from OHPC stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by OHPC by reason of breach by the said contractor of any of the terms and conditions contained in the said contract or by reason of the said Contractors failure to perform the said contract. Any such demand made on the bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs.

2. We, the ..... Bank Limited to pay OHPC any money so demanded notwithstanding any dispute or disputes raised by the said Contractor in any suit or proceeding pending before any Court or Tribunal relating thereto, our liability under this present being absolute and unequivocal.

The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the Contractor(s)/Supplier(s) shall have no claim against us for making such payment.

3. We, the ..... Bank Limited further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said contract and that it shall continue to be so enforceable till all the dues of the OHPC under or by virtue or the said agreement, have been fully paid and its claims satisfied or discharged until the

Divisional Head, P&C Division, UIHEP, Mukhiguda, Odisha Hydro Power Corporation certified that the terms and conditions of the said agreement have been fully and properly carried out by the said contractors and accordingly, discharges this guarantee. Unless a demand or claim under this guarantee is made on us in witting on or before the expiry of ..... months from the last delivery of materials or ..... months from its use whichever is earlier we shall be discharged from all liability under this guarantee thereafter.

4. We, the ..... Bank Limited further agree with OHPC that OHPC shall have the fullest liberty, without our consent and without affecting in any manner our obligations hereunder, to vary any of the terms and conditions of the said agreement to extend time of performance by the said Contractor(s) and to forbear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any such variation, postponement, or extension being granted to the said Contractor(s) or by any such matter of thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

5. This guarantee shall not be discharged due to the change in the name, style and constitution of the Bank or the Contractors(s) / supplier(s).

6. We, the ..... Bank Limited lastly undertake not to revoke this guarantee during its currency except with the previous consent of OHPC in writing.

7. Notwithstanding anything to the contrary herein, no obligation of the Guarantor to pay any amount under this Guarantee shall arise prior to the fulfillment of the following conditions precedent.
a) Written claim / demand (s) in terms of this Guarantee of an aggregate amount less than or equal to the Guaranteed Amounts is/are made by the Beneficiary hereunder and
b) such written claim / demand(s) is / are delivered to the Guarantor on or before …….. at the ……. …… **(branch in Odisha)**

8. The beneficiary may verify the genuineness of the bank guarantee by seeking confirmation of its issuance by writing to the email ID …… **or** to the detail address of the branch: ……**(other than issuing branch)**

Dated the ..... day of ..... 2025- -

Witness with Address

1.
2.

For ..... Bank Limited.

ANNEXURE–10

TENDER CALL NOTICE NO. UIHEP-07/ 2025-26 Dated 05.05.2025

DATA ON EXPERIENCE

(i) Name of the manufacturer / manufacturer's channel partner:

(ii) Standing of the firm and rating of Transformer, quoted:

(iii) Description of Transformer, quoted, supplied and installed with the name(s) of the Organizations to whom supplies were made along with Purchase Order No.& Date, wherein, atleast1(one)certificate shall be from a State/Central P.S.U or in accordance with Qualifying Requirement, as stipulated at Cl. No.35 of Part-I, Section-III of this Bids Specification

(iv) Details as to where installed and commissioned, as per the above Qualifying Requirement.

(v) Testing facilities at manufacturer's works.

(vi) A list of purchase orders of the same rated Transformer, as offered as per technical specification or higher rating (both MVA & Voltage rating) along with user's certificate, as applicable in accordance with the above Qualifying Requirement of this Specification. User's certificate shall be legible and must indicate, user's name, address, designation, Telephone & FAX No., place of use and satisfactory performance of the Transformers for a period, as stipulated in the above Qualifying Requirement, from the date of commissioning.

Place:

Date:

SIGNATURE OF THE TENDERER WITH SEAL & DATE

ANNEXURE – 11

EXPERIENCE CERTIFICATE

TENDER CALL NOTICE NO. UIHEP-07/ 2025-26 Dated 05.05.2025

PROFORMA FOR PERFORMANCE STATEMENT

Name of the Firm: _____

Order placed by full name & address of purchaser}	Order No. and Date	Description and quantity of ordered Equipment	Date of completion of Delivery		Remarks indicating reasons for late delivery, if any	Has the equipment been satisfactorily Functioning? (Attach a Certificate from the purchaser)
			As per Contract	Actual		

SIGNATURE OF THE TENDERER WITH SEAL &DATE

N. B.: The Bidder may attach additional sheets for submission of above Performance Statements.

ANNEXURE-12

GUARANTEED TECHNICAL PARTICULARS (GTP)

[TO BE FILLED IN BY THE BIDDER, IN EXCEL FORMAT OF THE TECHNO COMMERCIAL BID SHEET]

Sl. No.	Description	Bidder's offer
1	Name of the Manufacturer	
2	Installation [indoor/outdoor]	
3	Reference standards	
4	Continuous Ratings	
a	Type of cooling	
b	Rating [MVA]	
i	With ONAN cooling	
ii	With ONAF cooling	
c	Rated voltage	
i	HV [KV rms.]	
ii	LV [KV-rms.]	
d	Highest system voltage	
i	HV [KV rms.]	
ii	LV [KV-rms.]	
e	Rated frequency with ±% variation	
f	Number of phases	
g	Current at rated full load and on Principal tap	
i	HV [Amps]	
ii	LV [Amps]	
5	Connections	
	HV	
	LV	
6	Connection symbol and vector group	
7	Temperature rise	
a	Temperature rise of oil above ambient temperature [by Thermometer]	
i	At full ONAN rating [°C]	
ii	At full ONAF rating [°C]	
b	Temperature rise of windings above ambient temperature [By resistance method]	
i	At full ONAN rating [°C]	
ii	At full ONAF rating [°C]	
c	Temperature gradients between windings & oil.	
d	Limit of Hot spot temperature for which the Transformer is designed [°C]	
e	Period of operation of transformer at full load without calculated winding hot spot Temperature exceeding l40°C and with	
i	50% Coolers	
ii	100% Coolers	

8	Type of ON load tap changing switch		
9	Tapping on windings for		
i	Constant flux/variable flux/combined Regulation		
ii	Tapping provided at		
iii	Number of steps		
iv	Range of tapping for variation [+ percent to- Percent]		
10 i	No load loss at rated voltage and frequency at Principal tap [KW]		
ii	No load loss at the voltage corresponding to Highest tap [KW]		
11	Load loss at rated output, rated frequency, corrected for 75 °C winding temperature at: -	ONAN	ONAF
i	Principal tap [In KW]		
ii	Highest tap [In KW]		
iii	Lowest tap [In KW]		
12	Auxiliary losses at rated output, normal ratio, rated voltage, rated frequency and ambient Temperature [KW]		
13	Total losses at normal ratio inclusive of auxiliary equipment losses [KW]		
14	Positive sequence impedance on rated MVA base at rated current and frequency at 75°C Winding temperature at		
i	Principal tap [%]		
ii	Highest tap [%]		
iii	Lowest tap [%]		
15	Zero sequence impedance at reference Temperature of 75°C at principal tap [%]		
16	% reactance at rated MVA base at rated Current and rated frequency at		
i	Principal tap [%]		
ii	Highest tap [%]		
iii	Lowest tap [%]		
17	% resistance at rated MVA base at rated current and rated frequency at		
i	Principal tap [%]		
ii	Highest tap [%]		
iii	Lowest tap [%]		
18	% Impedance at rated MVA base at rated Current and rated frequency at		
i	Principal tap [%]		
ii	Highest tap [%]		
iii	Lowest tap [%]		
19 a	Polarisation index i.e. ratio of Megger values at 600 secs to 60 secs, (H.V. to E, L.V. to E, H.V. to L.V.		

b	Regulation at full load and 75°C winding Temperature expressed as a percentage of normal voltage				
i	At unity power factor [%]				
ii	At 0.8 power factor [lagging][%]				
20	Efficiency at 75°C winding temperature as derived from guaranteed loss figures and at	Unity power factor		0.8 Power factor	
a	At full load [%]				
b	At ¾ load [%]				
c	At ½ load [%]				
21 i	Maximum efficiency [%]				
ii	Load at which maximum efficiency occurs [% of full load]				
	Time in minutes for which the transformer can be run at full load without exceeding the maximum permissible temperature at reference ambient temperature when supply to: -				
i	Fans are cut off				
23	Short time thermal rating of				
i	HV winding in KA and duration in seconds				
ii	LV winding in KA and duration in seconds				
24	Permissible over loading: -				
a	HV winding				
b	LV winding				
25	Terminal arrangement				
a	High voltage [HV]				
b	Low voltage (LV)				
c	Neutral				
26	Insulating and cooling medium				
27 [A]	Test voltage	HV	LV	HVN	LVN
i	Lightning impulse withstand test voltage [KVP]				
ii	Power frequency withstand test voltage [dry and wet][for 1 minute] [KV-rms.]				
iii	Separate source withstand voltage (KV-rms)				
28	Partial discharge level as per relevant up-to-date IEC				
29	Noise level when energized at normal voltage, frequency without load and with all cooling fans in running condition.				
30	External short circuit withstand capacity [MVA] and duration [seconds]				
31	Over-fluxing withstand capability of the Transformer				
32	DETAILS OF CORE				
a	Type of core construction				
b	Type of corner joints of the core				

c	Flux density as adopted for offered transformer design at	
i	Rated voltage [220/33 KV] & rated frequency 50 Hz][in Tesla]	
ii	Highest system voltage [245/36 KV] and lowest system frequency [48.5Hz.][In Tesla]	
d	**No load current, no load loss and no load power factor at normal ratio and frequency**	
	[Amp/KW/p.f.] [With reference to 33KV side]	
i	10 percent of rated voltage	
ii	25percent of rated voltage	
iii	50 percent of rated voltage	
iv	85 percent of rated voltage	
v	100 percent of rated voltage	
vi	105percent of rated voltage	
vii	110 percent of rated voltage	
viii	112.5 percent of rated voltage	
ix	115 percent of rated voltage	
x	120 percent of rated voltage	
xi	121 percent of rated voltage	
xii	125 percent of rated voltage	
e	**Core laminations:-**	
i	Make & type[HIB/Laser grade] of core Material	
ii	BIS Grade of core laminations	
iii	Thickness of core lamination [mm]	
iv	Specific loss [watt/Kg.] at Design Flux Density at rated voltage & rated frequency	
v	Specific loss [watt/Kg.] at Design Flux Density at highest system voltage & lowest system frequency	
vi	Whether specific core loss graph [flux density vs. watt/Kg.] submitted	
vii	VA/Kg at Design Flux Density at rated voltage & rated frequency	
viii	VA/Kg at Design Flux Density at 110% of rated voltage & rated frequency	
ix	VA/Kg at Design Flux Density at 121% of rated voltage & rated frequency	
x	VA/Kg. at Design Flux Density and at highest system voltage & lowest system frequency	
xi	Whether VA/Kg. Vs. flux density graph submitted.	
xii	Insulation of core laminations	
f	**CORE ASSEMBLY:-**	
i	Core diameter [mm]	

ii	Core window height [mm]		
iii	Core leg centre [mm]		
iv	Gross core cross-sectional area [m^2]		
v	Whether details of core widths, stacks and Calculation furnished as per enclosed annexure		
vi	Distance between centres [mm]		
vii	Total height of core [mm]		
viii	Core belting		
	1) Details of core belting.		
	2) Material, grade & type.		
	3) Width.		
	4) Thickness.		
	5) Fixing method.		
ix	Details of top end frame.		
x	Details of Bottom end frame.		
xi	Details of clamp plate [Material, thickness, Insulation]		
xii	Core stacking factor		
xiii	Net core area Sq. m.		
xiv	Total core weight [kg]		
xv	Building Factor		
xvi	Core loss basing on core loss graph at operating Flux density [rated voltage and rated Frequency] [kw]		
xvii	Margin towards corner joints, cross fluxing etc [kw]		
xviii	Total core loss at rated voltage and rated Frequency [xiv+xvii] [kw]		
xix	Dielectric loss at rated voltage and rated Frequency [KW]		
xx	No load loss at rated voltage and rated Frequency [xviii+xix] [KW]		
g	Describe location/method of core grounding		
h	Details of oil ducts in core		
i	Peak value of magnetising Inrush current (% of HV rated current).		
33	**DETAILS OF WINDINGS.**	HV	LV
a	Type of winding		
b	Material of the winding conductor.		
c	Maximum current density of windings [At rated current] [Normal Tap] and Conductor area	Conductor/ Current area [cm^2] density [A/cm^2]	
i	HV		
ii	Regulating		
iii	L.V.		
d	Whether HV windings are interleaved.		
e	Whether windings are pre-shrunk?		
f	Whether adjustable coil clamps are provided for H.V. and L.V. windings?		

g	Whether steel rings are used for the windings? If so, whether these are split?			
h	Whether electrostatic shields are provided to obtain uniform voltage distribution in the Windings?			
i	Winding Insulation	Type & class. Graded or ungraded		
ii	H.V. & Regulating			
iii	LV			
j	Insulating material used for			
i	H.V. & Regulating winding			
ii	L.V Winding			
iii	For core bolts washers and end plates.			
iv	Tapping connection.			
k	Insulating material used between			
i	H.V. and L.V. winding			
ii	H.V. and Regulating winding			
iii	Core and L.V winding.			
iv	H.V. to H.V.winding [between phases]			
l	Type of axial coil supports.			
i	H.V. winding			
ii	LV winding			
iii	Regulating winding			
m	Type of radial coil supports			
i	HV winding			
ii	Regulating winding			
iii	LV winding			
n	Maximum allowable torque on coil clamping bolts	HV	Regulating	LV
o	Bare conductor size (mm**).**			
p	Insulated conductor size (mm).			
q	No. of conductors in parallel (Nos.).			
r	No. of turns/phase			
s	No. of discs/phase			
t	No. of turns/disc			
u	Gap between discs. (mm).			
v	Inside diameter (mm).			
w	Outside diameter (mm**).**			
x	Axial height after shrinkage (mm**).**			
y	D.C.RESISTANCE			
i	L.V winding at 75 ° C (Ohms).			
ii	HV winding and Regulating winding at normal tap at 75° C (Ohms).			
iii	HV winding and Regulating winding at highest tap at 75° C (Ohms).			
iv	HV winding and regulating winding at lowest tap. (Ohms).			
z	I^2R loss for winding at 75^0C			
i	At normal tap position (in KW)			
ii	At maximum tap position (in KW)			

iii	At minimum tap position (in KW)				
aa	I^2R loss at 75^0C towards connecting leads for windings, bushings, OLTC etc.				
i	At normal tap position (in KW)				
ii	At maximum tap position (in KW)				
iii	At minimum tap position (in KW)				
ab	Eddy current losses in winding (in KW) at 75 deg.C				
i	At normal tap position.				
ii	At maximum tap position.				
iii	At minimum. tap position.				
ac	Stray losses in tank & other parts of transformer (in KW) at 75 deg.C				
i	At normal tap position.				
ii	At maximum tap position.				
iii	At minimum. tap position.				
ad	Any special measures taken to reduce eddy current losses and stray losses, mention in details.				
ae	Load losses at 75°C [I^2R + stray].				
i	Normal tap position [KW]				
ii	Highest tap position [KW]				
iii	Lowest tap position [KW]				
af	Details of special arrangement provided to improve surge voltage distribution in the windings				
ag	Tandelta (Power factor) of Winding (Max.) at measured temperature				
34	**BUSHINGS.**	HV	LV	HV Neutral	LV Neutral
a	Make and type				
i	Rated voltage class [KV-rms.]				
ii	Rated current [Amps.]				
b	Lightning Impulse withstand test voltage [1.2/50 microsecond][KVP]				
c	Switching surge withstand test voltage [KVP]				
d	Power frequency withstand test voltage				
i	Wet for 1 minute [KV-rms]				
ii	Dry for 1 minute [KV-rms]				
e	Power frequency visible corona discharge voltage [KVP]				
f	Partial discharge level [PC]				
g	Minimum creepage distance in mm				
h	Minimum creepage distance in mm [protected]				
i	Whether test-tap is provided?				
j	Quantity and grade of oil in bushing and Specification of oil used [Kg.]				
k	Weight of assembled bushing [Kg.]				
l	Minimum clearance height for removal of Bushing [mm]				

m	Under oil flashover or puncture impulse voltage [KVP]		
n	Under oil flashover or puncture power frequency Voltage (KV-rms).		
o	Phase to earth clearance in air of live parts at the top of bushings.		
p	Maximum tan delta value at measured temperature		
35	**Minimum clearance [mm]**	Between Windings	Phase to ground
A)	**Out of Oil**		
	HV		
	LV		
B)	**In Oil**		
i)	LV to Core		
ii)	LV to top yoke		
iii)	LV to bottom yoke		
iv)	LV to HV (radially)		
v)	HV to Regulating(radially)		
vi)	HV to top yoke		
vi)	HV to bottom yoke		
vii)	Regulating to top yoke		
viii)	Regulating to bottom yoke		
ix)	Reg. winding to Reg. winding		
x)	Regulating winding to tank		
a)	Length wise		
b)	Breadth wise		
c)	Width wise		
N:B- Winding Arrangement-CORE-LV-HV-REGULATING			
36	**Weight [Tolerance + 5%]** [Approximate value is not allowed]		
a	Core [Kg.]		
b	Core with clamping [Kg.]		
c	H.V. winding insulated conductor [Kg.]		
d	L.V. winding insulated Conductor [Kg.]		
e	Regulating winding insulated conductor [Kg.]		
f	Coils with insulation [Kg.]		
g	Core and winding [Kg]		
h	Oil required for first filling [Liter/Kg.]		
i	Tank and fittings with accessories [Kg.]		
j	Untanking weight [Kg.]		
k	Total weight with oil and fittings		
l	along with accessories [Kg.]		
37	**DETAILS OF TANK**		
a	Material for Transformer tank		
b	Type of tank		
c	Thickness of sheet [No approximate value to be mentioned]		
i	Sides [mm]		
ii	Bottom [mm]		
iii	Cover [mm]		

iv	Radiators [mm]	
d	Inside dimensions of main tank [No approximation in dimensions to be used]	
i	Length [mm]	
ii	Breadth [mm]	
iii	Height [mm]	
e	Outside dimensions of main tank [No approximation in dimensions to be used]	
i	Length [mm]	
ii	Breadth [mm]	
iii	Height [mm]	
f	Thickness of spray galvanisation of tank bottom	
g	Vacuum recommended for hot oil circulation [torr]	
h	Vacuum to be maintained during oil filling in Transformer tank [torr]	
i	Vacuum to which the tank can be subjected without distortion [torr]	
j	No. of bi-directional wheels provided	
k	Track gauge required for the wheels	
i	Transverse axis	
ii	Longitudinal axis	
l	Type and make of pressure relief device and minimum pressure at which it operates [Kpa]	
38-A	**CONSERVATOR**	
a	Total volume [Liters]	
b	Volume between the highest and lowest visible Oil levels [Litres]	
c	Power required by heaters [If provided][KW]	
d	Conservator sheet thickness (mm.)	
38-B	**DETAILS OF AIRCELL OF CONSERVATOR**	
a	Make	
b	Type	
c	Capacity	
d	Size	
39	**OIL QUALITY**	
a	Governing standard	
b	Density in gms/cu-cm	
c	Kinematics viscosity in CST	
d	Inter facial tension at 27°C in N/m	
e	Flash point in °C	
f	Pour point in °C	
g	Acidity [neutralization value] in mg of KOH/gm	
h	Corrosive sulfur in %	
i	Electric strength	

	[Breakdown voltage]	
i	As received [KV-rms.]	
ii	After treatment [KV-rms.]	
j	Dielectric dissipation factor [Tan-delta] at 90°C	
k	Saponification value in mg of KOH/gm	
l	Water content in ppm	
m	Specific resistance	
i	At 90°C [ohm-cm]	
ii	At 27 °C [ohm-cm]	
n	N- dm analysis CA%	
	CM%	
	CP%	
o	Oxidation stability	
i	Neutralization value after oxidation	
ii	Total sludge after oxidation	
p	Characteristic of oil after ageing test as per ASTMD-1934	
i	Specific resistance at	
	27°C [ohm-cms]	
	90°C [ohm-cms]	
ii	Tan delta	
iii	Sludge content	
iv	Neutralization number	
v	Percentage of Napthenic content	
vi	Percentage of paraffinic content	
vii	Details of oil preserving equipment offered	
40	**RADIATORS**	
a	Overall dimensions lxbxh [mm]	
b	Total weight with oil [Kg.]	
c	Total weight without oil [Kg.]	
d	Thickness of radiator tube [mm]	
e	Types of mounting	
f	Vacuum withstand capability	
g	Total radiating surface in sq.m	
h	Type and make of material used for the radiators	
i	Total number of radiators/Banks for Transformer and dimensions of tubes.	
j	Thickness of hot dip galvanization of radiators.	
41	**COOLING EQUIPMENT**	Fan motor
a	Make and type	
b	No. of connected units	
c	No. of stand -by units	
d	Rated power input	
e	Capacity [cu-m/min. or] [liters/min]	
f	Rated voltage [volts]	
g	Locked rotor current [Amps.]	
h	Efficiency of motor at full load [%]	

i	Temperature rise of motor at full load [°C]		
j	BHP of driven equipment		
k	Temperature range over which control is adjustable [°C]		
l	Whether the fans are suitable for continuous operation at 85 % of their rated Voltage.		
m	Estimated time constant in hours for		
i	Natural cooling		
ii	Forced air cooling		
42	**GAS AND OIL OPERATED RELAY**		
a	Make		
b	Type		
c	Size		
d	Whether supervisory alarm and trip contac**ts** provided and their sizes and Nos.		
43	**TEMPERATURE INDICATORS**	Oil Temp**.** Indicator	Winding Temp. Indicator
a	Make and type		
b	Permissible setting ranges for alarm and trip		
c	Number of contacts		
d	Current rating of each contact		
e	Whether supervisory alarm contacts provided?		
f	Size [lxbxd]		
g	Nos.		
h	Ratio and type of CT used for winding Temperature indicators.		
44	**APPROXIMATE OVERALL DIMENSIONS OF TRANSFORMER INCLUDING COOLING SYSTEM, TAP CHANGING**		
a	Length [mm]		
b	Breadth [mm]		
c	Height [mm]		
45 a	Minimum clearance height for lifting core and Winding from tank [mm]		
b	Minimum clearance height for lifting tank cover [mm]		
46	**SHIPPING DETAILS**		
a	Approximate weight of heaviest package [Kg.]		
b	Approximate dimensions of largest package [Kg.]		
47	Transformers will be transported with oil/gas.		
48	Size of rail recommended for the track.		
49	Details of Neutral Current Transformers		
a	Quantity		

b	Type and voltage class	
c	No. of cores	
d	Ratio	
e	VA burden	
f	Accuracy class	
g	Minimum knee point voltage [volts]	
h	Maximum magnetization current at minimum Knee point voltage [mA]	
i	Maximum secondary winding resistance at 75°C [ohms]	
50	**MARSHALLING KIOSK**	
a	Make and type	
b	Details of apparatus proposed to be housed in the Kiosk	
51	Details of anti-earthquake device provided, if any	
52	Separate conservator and Buchholz relay provided	
53	**TAP CHANGING EQUIPMENT** [These details refer to the basic rating of O.L. T.C. as guaranteed by OLTC manufacturers]	
a	Make	
b	Type	
c	Power flow [Uni.-directional/bi - directional/restricted bi-directional]	
d	Rated voltage to earth [KV]	
e	Rated current [Amps.]	
f	Step voltage [volts]	
g	Number of steps	
h	Control - manual/local-electrical/remote-electrical	
i	Voltage control [Automatic/Non - automatic]	
j	Line drop compensation provided/not provided	
k	Parallel operation	
l	protective devices	
m	Auxiliary supply details	
n	Time for complete tap change [one step] [Sec.]	
o	Diverter selector switch transient time [cycles]	
p	Value of short circuit current [Amps][minimum] along with duration	
q	Maximum impulse withstand test voltage with 1.2/50 microseconds full wave between switch Assembly and ground [KVP]	

r	Maximum power frequency test voltage between Switch assembly and earth [KV-rms]	
s	Maximum impulse withstand test voltage with 1.2/50 microseconds across the tapping range [KVP]	
t	Approximate overall dimensions of tap changer [WxBxD] in mm.	
u	Approximate overall weight [Kg.]	
v	Approximate mass of oil [Kg.]	
w	Particulars of the OLTC control panel for installation in control room	
54	DRIVING MECHANISM BOX	
a	Make and type	
b	Details of apparatus proposed to be housed in the box	
55	Types of terminal connectors and drawing No	
a	HV	
b	LV	
56	Details of painting, galvanization conforms to this Specification [Yes/No]	
57	Type of oil level indicator and whether Supervisory alarm contact for low oil level provided [Yes/No]	
58	Type and size of thermostat to be used	
59	No. of breathers provided [Nos.]	
60	Type of dehydrating agent used for breathers	
61	Valve sizes and numbers	
a	Drain valves- mm-Nos.	
b	Filter valves- mm-Nos.	
c	Sampling valves- mm-Nos.	
d	Radiator valves- mm-Nos.	
e	Other valves- mm-Nos.	
62 a	Type and make of PRV.	
b	No. of each type of devices per transformer	
c	Min. pressure at which device operates.	
63	Please enclose the list of accessories and fittings, being provided on transformer. Please confirm, these are as stipulated in the tender.	
64	Whether the transformer, covered is fully type tested and if so, whether copies of type test certificates, enclosed with the tender.	
65	Whether tenderer can supply transformer, wound on vertical coil winding machine. Preference shall be given to the tenderer who will ensure	

	supply of transformer wound on vertical winding machines.	
66	In case Sl.No.65 is not confirmed, what are the additional pre-cautions, which shall be taken by the tenderer to justify that the coil, wound on horizontal machine shall be equivalent in all respects to that which are wound on vertical winding machine.	
67	What are the arrangements, available for jointing the Winding. Preference shall be given to the tenderer using high-frequency brazing machines. In case other jointing techniques are used; adequacy of the same is to be recorded. Please note that bolted joints in the winding are not acceptable. This should be confirmed here.	
68	Please confirm that you will guarantee maximum impedance variation between phases within the limit of 2% only.	
69 a	Please confirm that the transformer shall be dried by vapour-phase drying method. Please specify level of dryness.	
b	In case, other methods of drying are used, the level of dryness, so achieved should be identical to that by VPD. Adequacy of such system should be justified.	
70	Please confirm whether the In-House facilities for all routine tests as per this Tender Specification are available with the tenderer and the tenderer shall agree to conduct these tests on the transformer in the event of order.	
71	**Whether the Tenderer has got In-House core-cutting facility for cutting core materials for the transformer ratings as offered. (YES/NO)**	
72	**If 'YES', following informations /confirmations are required: -**	
a	Name of the manufacturer of HIB Grade core material from whom core materials will be directly imported or through their accredited marketing organization of repute. If to be imported through the accredited Marketing Organisation, Please state the name of such Marketing Organisation and please enclose the relevant documents with the Tender Offer regarding accreditation of the said	

	Marketing Organisation by the manufacturer of the HIB core material.	
b	Grade, Trade Name and Thickness of the core material, to be imported	
c	Whether agreed for witnessing of core materials by OHPC's representative(s)	
d	Whether, the Bidder has past experience towards direct import of core materials. If 'YES', the copies of recent past Import documents to be furnished with the Tender Offer (Please state, whether the said import documents are enclosed with the Tender Offer)	
e	Whether, the Bidder has got In-House CNC Machine facility for cutting of core materials	
f	Whether the Bidder is agreed to follow the procedures, as stipulated at Cl.No.5.4.8 (o), (p) &(q) of this Technical Specification, as applicable for those, who have got In- House core-cutting facility	
73	**If the Bidder has no In-House core-cutting facility, the following informations / confirmations are required: -**	
a	Name of the core manufacturer of core materials from whom core materials will be directly imported or through their accredited marketing organization of repute. If to be imported through the accredited Marketing Organisation, Please state the name of such Marketing Organisation and please enclose the relevant documents with the Tender Offer regarding accreditation of the said Marketing Organisation by the manufacturer of the HIB core material.	
b	Grade, Trade Name and Thickness of the core material, to be imported	
c	Name of the core-cutting vendor and whether the said vendor has got In-House CNC Machine facility for cutting of core materials and whether the said vendor has been accredited by ISO	
d	Whether, the Bidder has past experience towards direct import of core materials. If 'YES', the copies of recent past Import documents to be furnished with the Tender Offer (Please state, whether the said import documents are enclosed with the Tender Offer)	

	Whether the Bidder is agreed to follow the procedures, as stipulated at Cl.No.5.4.8 (o), (p) &(q)(1), (2), (3), (4), (5),(6) & (7) of this Technical Specification, as applicable for those, who have got no In-House core-cutting facility.	
	Please confirm that the facility for partial discharge test Is available with the tenderer and the tenderer shall agree to conduct This test on transformer in the event of order.	

Place
Date

Bidder's name:
Signature, Designation, Seal

ANNEXURE–13

TENDER CALL NOTICE NO. UIHEP-07/ 2025-26 Dated 05.05.2025

DETAILS OF LOSS CALCULATIONS FOR 20 MVA,220/33 KV POWER TRANSFORMER

[To be filled in by the Bidder]

Sl. No.	Description	Bidder's offer
1	Name of the Firm	
2	Flux density as adopted for offered transformer design, at	
i	245/36 KV and 48.5 Hz [Tesla]	
ii	220/33 KV & 50.0Hz [Tesla]	
3 i	Core weight in Kg.	
ii	Gross core area [mm²]	
iii	Stacking factor	
iv	Net core iron area [mm²] [ii x iii]	
v	No. of LV Turns/Phase	
vi	Building Factor	
4 a)	Specific losses [W/Kg.]	
i	At designed flux density corresponding to 245/36 KV and 48.5 HZ.	
ii	At designed flux density corresponding to 220/33 KV and 50Hz.	
b)	Volt ampere/Kg	
i	At designed flux density corresponding to 245/36 KV KV and 48.5 Hz.	
Ii	At designed flux density corresponding to 220/33 KV and 50 Hz.	
5	Calculated/guaranteed iron loss in KW at: -	
i	Rated voltage and rated frequency	
ii	Maximum system voltage and lowest system Frequency	
6	Current density [A/Sq. mm] at normal tap for	
i	HV	
ii	Regulating	
iii	LV	
7	Conductor size [in mm²]	
a	HV	
i	Bare	
ii	Insulated	
iii	No of conductors in parallel	
b	Regulating winding	
i	Bare	
ii	Insulated	
iii	No of conductors in parallel	
c	L.V. winding	
i	Bare	
ii	Insulated	
iii	No. of conductors in parallel	
8	Total Bare copper conductor area (A) (Sq.mm.)	

i	HV			
ii	LV			
iii	Regulating			
9	No. of turns/phase(N) at	Highest tap	Lowest tap	Normal tap
i	HV			
ii	Regulating			
iii	LV			
10	Internal Diameter (in mm.)			
i	HV			
ii	Regulating			
iii	LV			
11	Outside Diameter (in mm.)			
i	HV			
ii	Regulating			
iii	LV			
12	Mean Diameter (Dm) (in mm.)			
i	HV			
ii	Regulating			
iii	LV			
13	Length of copper conductor(L) =Pie x Dm xN	Highest tap	Lowest tap	Normal tap
i	HV			
ii	Regulating			
iii	LV			
14	Per-phase resistance of winding (In ohms) at 75 deg. C=0.0211 X L/A	Highest tap	Lowest tap	Normal tap
i	HV			
ii	Regulating			
iii	LV			
15	I^2R loss for winding at 75^0C			
i	At normal tap position (in KW)			
ii	At maximum tap position (in KW)			
iii	At minimum tap position (in KW)			
16	I^2R loss at 75^0C towards connecting leads for windings, bushings, OLTC etc.			
i	At normal tap position (in KW)			
ii	At maximum tap position (in KW)			
iii	At minimum tap position (in KW)			
17	Eddy current losses in winding (in KW) at 75 deg.C			
i	At normal tap position.			
ii	At maximum tap position.			
iii	At minimum. tap position.			
18	Stray losses in tank & other parts of transformer (in KW) at 75 deg.C			
i	At normal tap position.			
ii	At maximum tap position.			
iii	At minimum. tap position.			
19	Calculated guaranteed Load losses (in KW) at 75 deg. C [15+16+17+18]			
i	At normal tap position.			

ii	At maximum tap position.	
iii	At minimum. tap position.	
20	Guaranteed cooler loss [in KW]	
21	Computed/guaranteed total loss in KW at rated voltage and rated frequency [Copper loss + cooler loss + Iron loss]	
i	At normal tap position.	
ii	At maximum tap position.	
iii	At minimum. tap position.	
22	Copper Weight (L X A X8.89 X 10^-3)	Bare / Insulated
i	HV	
ii	Regulating	
iii	LV	
iv	For Tap connections, star connection and any other [please specify]	
v	Total copper weight [i]+[ii]+[iii]+[iv]	
NB: -	1 Approximate value in weight and losses etc. are not allowed.	
	2 Tolerance of + 5% in weights may be quoted without any approximation	

ANNEXURE –14

TENDER CALL NOTICE NO. UIHEP-07/ 2025-26 Dated 05.05.2025

CHECK-LIST TOWARDS TYPE TEST REPORTS

Name of the Type Test	Date of Test	Name of the Laboratory where the Test has been conducted	Whether the Laboratory Govt. Approved	Name of the Govt. Organization which has witnessed the Type Test	Whether the Test Report is valid as per Clause No. 4.7.5.4 of T.S.	Whether the copy of Test Report incomplete shape along with the drawings etc. furnished or not?	Whether the Type Tested 20 MVA Transformer fulfils the Technical Requirements as per T.S.	Remarks
1	2	3	4	5	6	7	8	9

SIGNATURE OF THE TENDERER WITH SEAL & DATE

ANNEXURE–15

TENDER CALL NOTICE NO. UIHEP-07/ 2025-26 Dated 05.05.2025

CALIBRATION STATUS OF TESTING EQUIPMENTS AND INSTRUMENTS/METERS

Name of the Test	Meters & Equipment required for the corresponding Test with Range Accuracy, Make & Sl. No.	Date of Calibration	Due Date of Calibration	Name of Calibrating Agency	Whether Calibrating Agency is Govt. Approved	Whether documents related to Govt. Approval of the Calibrating Agency furnished	Whether the Meters / Equipment fulfill the Accuracy Class as per Calibration Report	Whether Calibrating Agency has put any limitation towards the use of the particular Meters /Equipment. If yes, state	In spite of Imposed Limitations, whether the particular Meter / Equipment can still be used. Justify its use for corresponding Test (s)	Remarks
1	2	3	4	5	6	7	8	9	10	11

SIGNATURE OF THE TENDERER WITH SEAL & DATE

PART – II
PRICE BID

PART – II (PRICE BID)

TENDER CALL NOTICE NO. UIHEP-07/ 2025-26 Dated 05.05.2025

PRICE BID (SCHEDULE-1)

Sl. No.	PARTICULARS	Price in Rupees
(A) Plant & Equipment		
1.	Unit Ex-factory price including oil and other accessories as per specification plus extra 10% reserve oil	
2.	Lump sum charges towards packing, forwarding, freight, transit insurance, loading & unloading inclusive of all taxes & duties	
3.	GST on 1. above as applicable with HSN code and in % as well as figures	
4.	GST on 2. above as applicable with HSN code and in % as well as figures	
*Sub- Total (**A**): FORD **UIHEP, Mukhiguda** price (1+2+3+4) in figures as well as words*		
(B) Erection, Testing & Commissioning Charges		
1.	**Erection, Testing & Commissioning** charges at ***UIHEP, Mukhiguda*** site (Lump sum)	
2.	GST on 1. above as applicable with HSN code and in % as well as figures	
*Sub- Total (**B**):* **Erection, Testing & Commissioning** *charges (1+2) in figures and words*		
(A) + (B)	**Total FORD *UIHEP, Mukhiguda* price including Erection, Testing & Commissioning charges inclusive of GST in figures and words**	
(C) Mandatory Spares as per Part- II, Schedule- 2		
1.	Base FORD ***UIHEP, Mukhiguda*** price drawn from Part- II, Schedule- 2	
2.	GST on base price (1 above) as applicable with HSN code and in % as well as figures	
*Sub Total (**C**): FORD **UIHEP, Mukhiguda** Mandatory Spares (1+2) in figures and words*		
Grand Total of Quoted Price [Sub-Total (A)+(B)+(C)] inclusive of GST in figures		
(Grand Total of Quoted Price [Sub-Total (A)+(B)+(C)] inclusive of GST in words)		

N. B.: -

1. To have a uniform price evaluation procedure, the Ex-works price of the Transformer must

include the cost of required quantity of oil and other accessories as per specification and these should not be quoted separately. Any deviation to the same shall render the price bid liable for rejection. Price quotation for O & M spares (Part- II, Schedule-3) are only for future reference and hence shall not be considered for evaluation of prices.

2. The tenderer should fill up the schedule properly and in full. The bids will be rejected, if the schedule of price is submitted in incomplete form. No post-bids correspondence will be entertained on break-up of prices. Also, the supplier should agree for delivery at UIHEP site.

3. Conditional offers will not be acceptable.

4. IEEMA Price Variation Regulations bearing Circular Number **140/PVC/DT_PT/05, Dated 10th November'2021** shall be applicable only for (a) Plant & Equipment as laid down in this specification (Section-III, Clause-5) and the quoted prices for **Erection, Testing & Commissioning** and mandatory spares shall be FIRM for all purposes including evaluation of the bids. Any deviation to this stipulation at any point in time shall not be entertained by OHPCL.

5. Rate of each mandatory spare (FIRM price only) should be quoted strictly as per price bid format and any bid, having lump sum price, quoted for all mandatory spares together is liable for rejection.

6. In case of detection of any discrepancy in the price- bids between figures and words, the quoted prices in words shall be treated as final & binding.

Place:

Date:

Signature of Tenderer
Name,
Designation and Seal

PART-II
PRICE BID (SCHEDULE- 2)
Details of Mandatory Spares

Sl. No.	Description of Mandatory Spares	Quantity	FORD FIRM PRICE (Rs.)
Sl.No.	*** Description**		
1	H.V. Bushing with metal parts and Gaskets	1 No.	
2	L.V. Bushing with metal parts and gaskets	1 No.	
3	HV Neutral Bushing with metal parts and gaskets	1 No.	
4	LV Neutral Bushing with metal parts and gaskets	1 No.	
5	Local and remote winding temperature indicators with contacts.	1 Set	
6	Oil temperature indictor with contacts	1 Set	
7	Pressure relief device.	1 No.	
8	Magnetic oil level gauge with low oil level alarm contacts	1 No.	
9	Cooler fan with motor.	1 No.	
10	Buchholz relay.	1 No.	
11	Tap position Indicator (Local and remote)	1 No.	

TOTAL PRICE-

GST on Spares, if any.

Any other LOCAL taxes on spares.

TOTAL FORD ***UIHEP, Mukhiguda*** PRICE exclusive of GST in figures and words-

Place:

Date:

N. B.: GST as applicable shall be extra. The total FORD ***UIHEP, Mukhiguda*** prices of mandatory Spares exclusive of GST shall be lifted from this table and quoted in Part- II, Schedule- 1 table given at Part-II Schedule –1.

Signature of Tenderer
Name,
Designation and Seal

PART-II
PRICE BID (SCHEDULE-3)

SCHEDULE OF SPARE PARTS FOR FIVE YEARS OF NORMAL O & M

Sl. No.	Particulars	Quantity (Nos)	Unit FORD Rate (Rs.)	Total FORD FIRM Price (Rs.)

Place:

Date:

Signature of Tenderer
Name,
Designation, Seal

N. B.

1. **The validity of the rates quoted shall be 1 year from the date of quotation.**
2. GST shall be paid extra as applicable.

OHPCL at its own discretion may or may not decide to procure/place order for O & M spares separately at a later date depending on site requirement. The quoted O & M spares & prices are only for future reference and therefore will not be taken into consideration for evaluation of bids.